FIG. 1

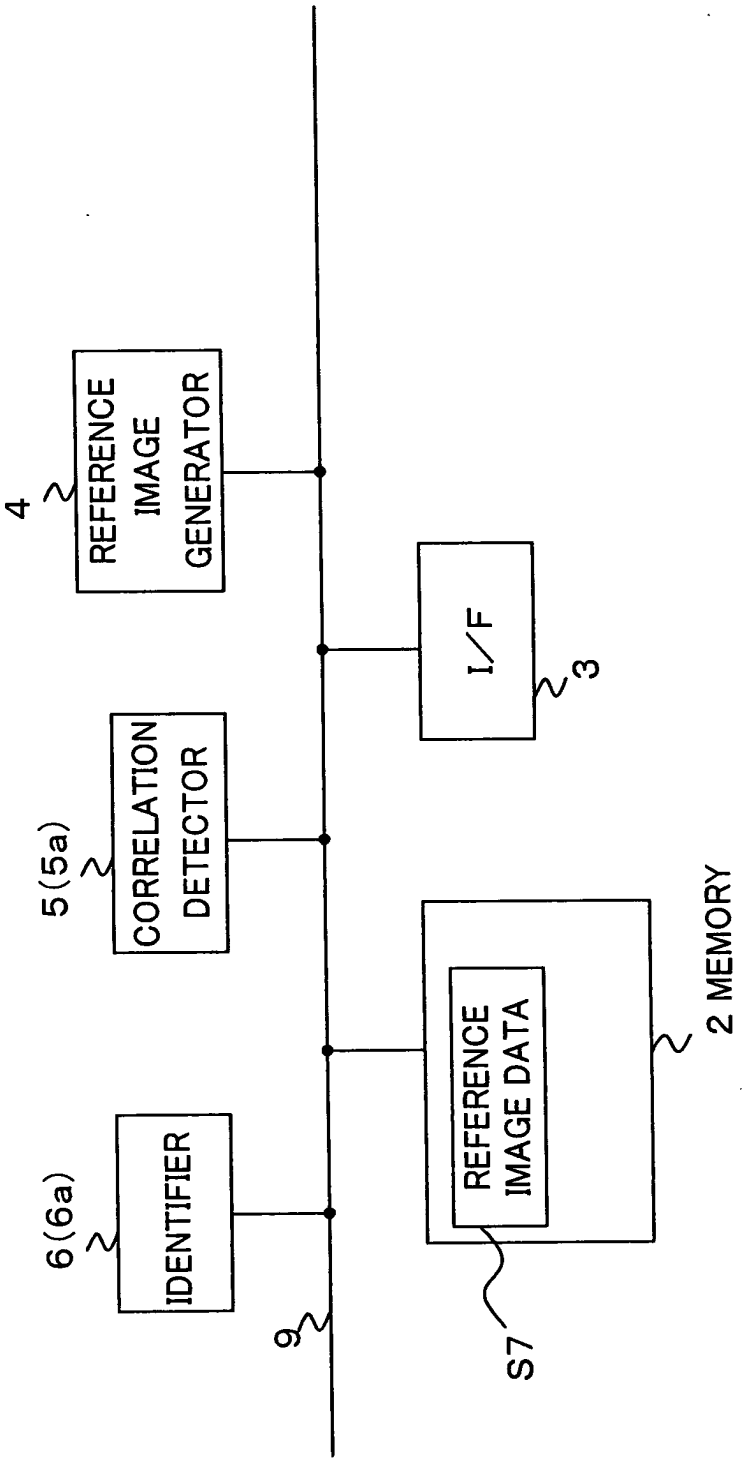

4
REFERENCE IMAGE GENERATOR
I/F
3
5(5a)
CORRELATION DETECTOR
2 MEMORY
REFERENCE IMAGE DATA
6(6a)
IDENTIFIER
9
S7
1

FIG. 2

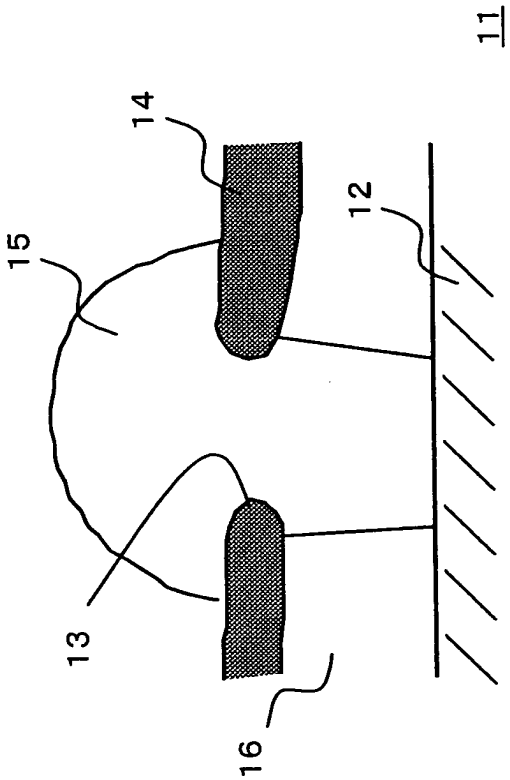


FIG. 3

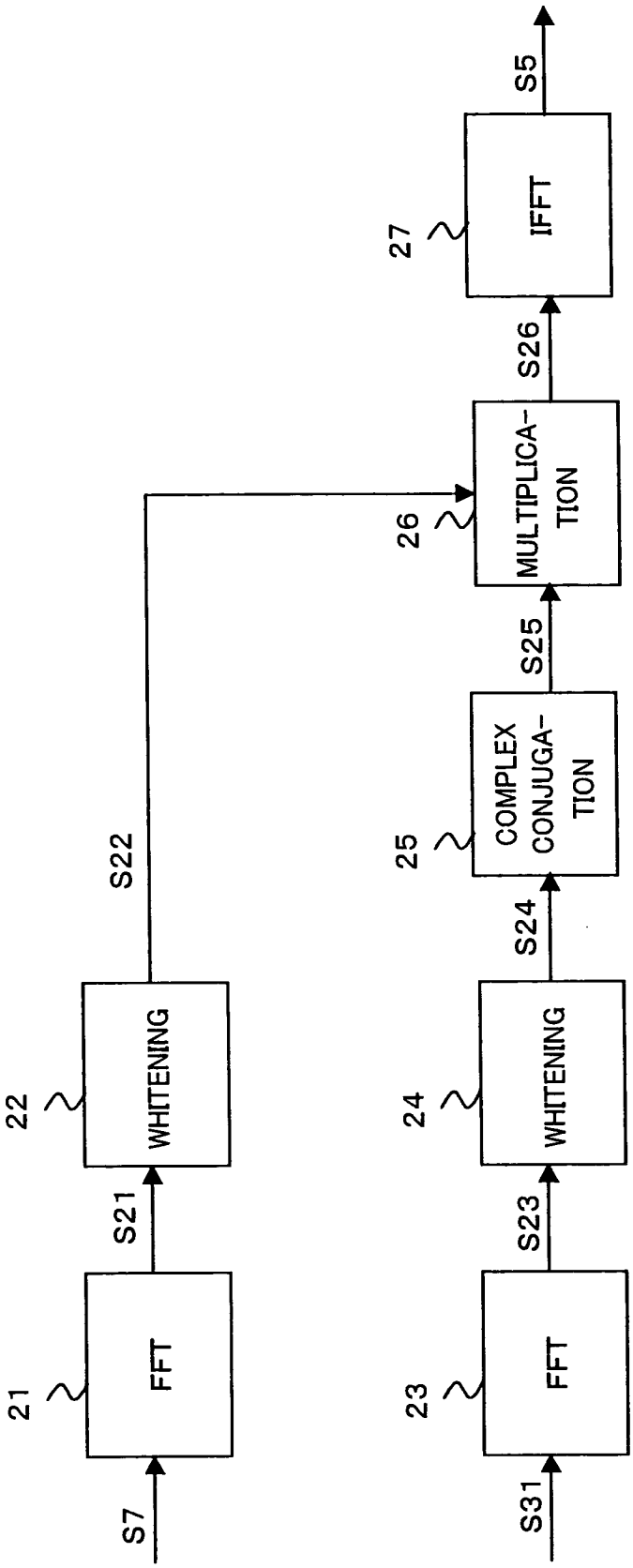
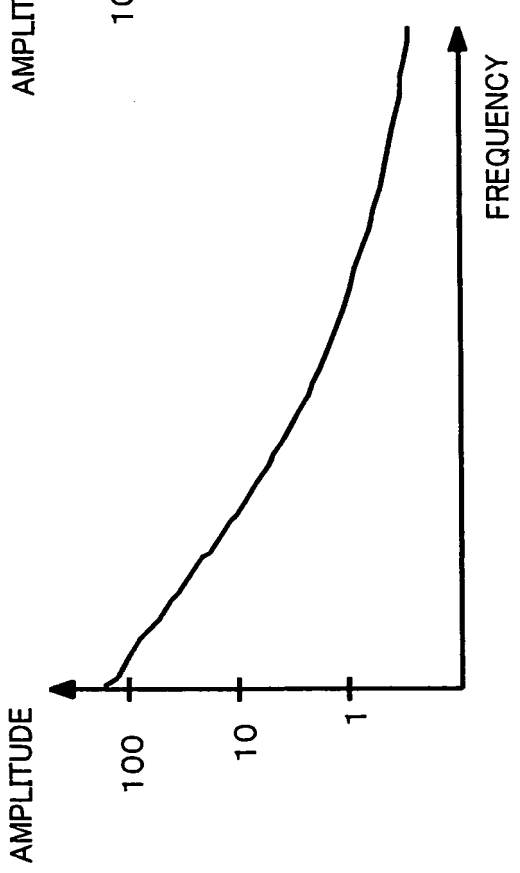
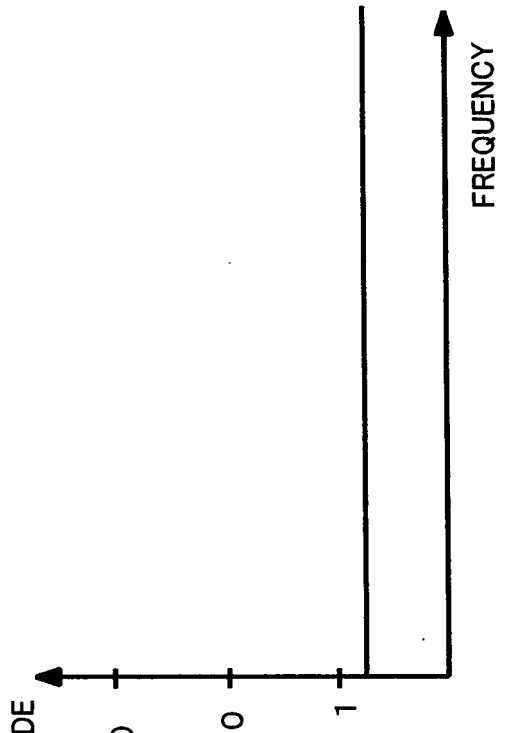

S7
21
FFT
S21
22
WHITENING
S22
S31
23
FFT
S23
24
WHITENING
S24
25
COMPLEX CONJUGA-TION
S25
26
MULTIPLICA-TION
S26
27
IFFT
S5
5

FIG. 4A



NATURAL IMAGE

FIG. 4B



DISTINCTIVE PATTERN OF LIGHT RECEIVING ELEMENTS

FIG. 5

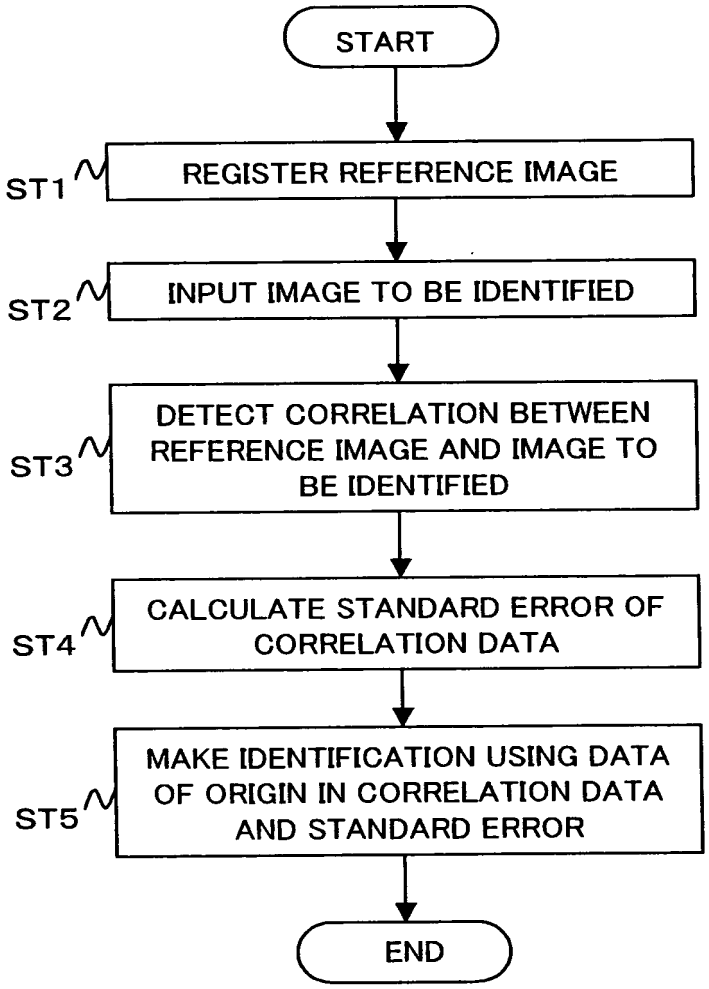

START
ST1
REGISTER REFERENCE IMAGE
ST2
INPUT IMAGE TO BE IDENTIFIED
ST3
DETECT CORRELATION BETWEEN REFERENCE IMAGE AND IMAGE TO BE IDENTIFIED
ST4
CALCULATE STANDARD ERROR OF CORRELATION DATA
ST5
MAKE IDENTIFICATION USING DATA OF ORIGIN IN CORRELATION DATA AND STANDARD ERROR
END

FIG. 6

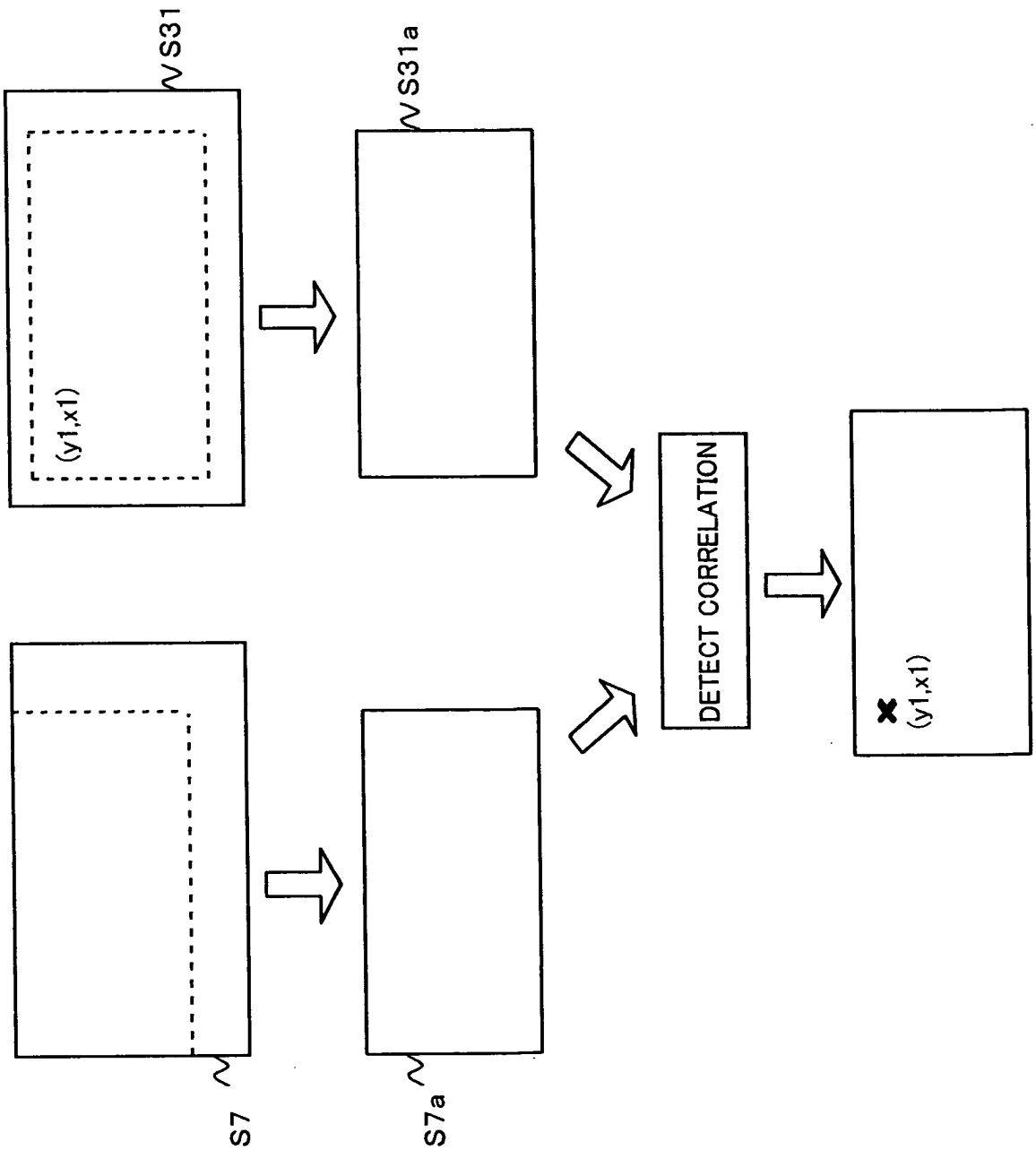


FIG. 7

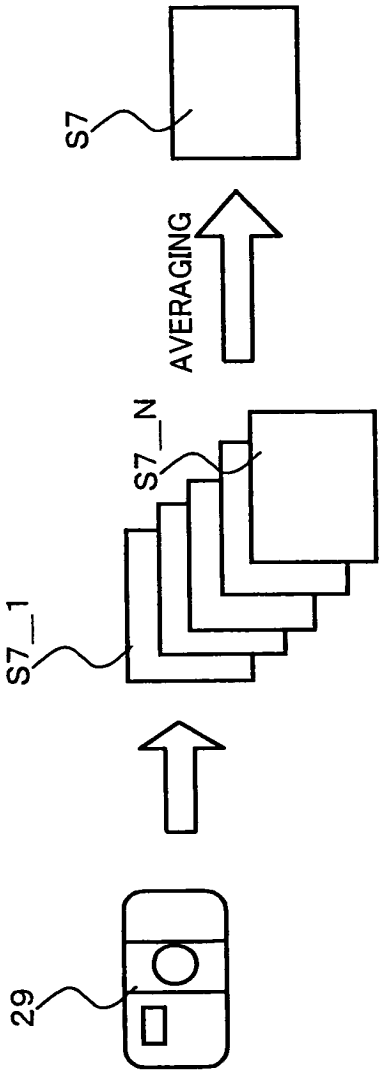


FIG. 8B

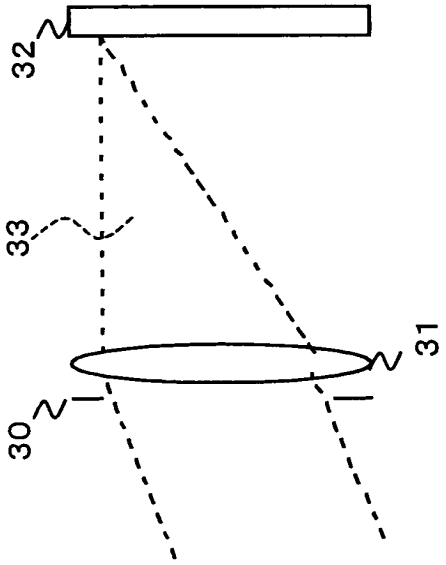


FIG. 8A

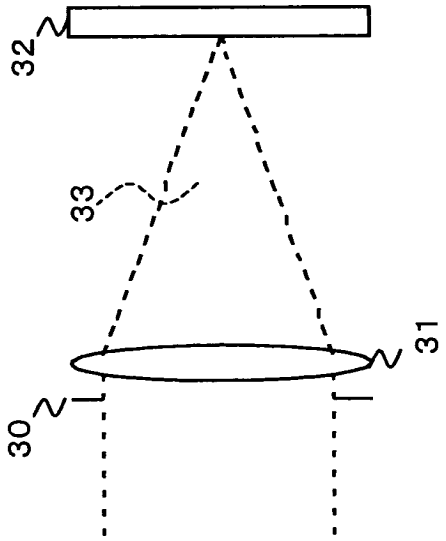


FIG. 9B

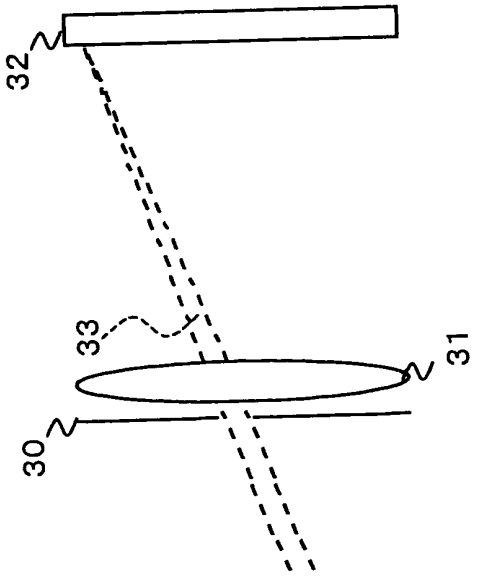
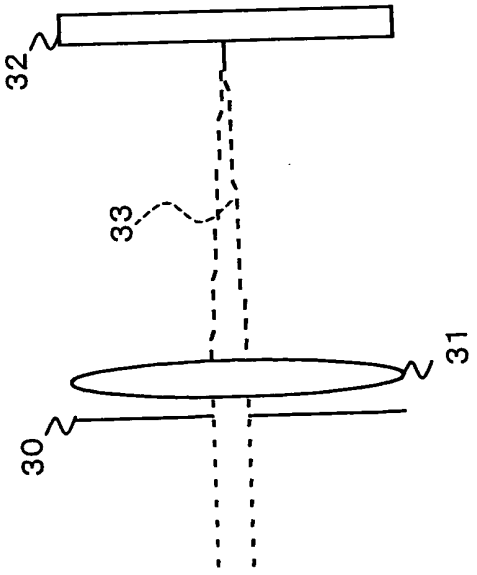


FIG. 9A



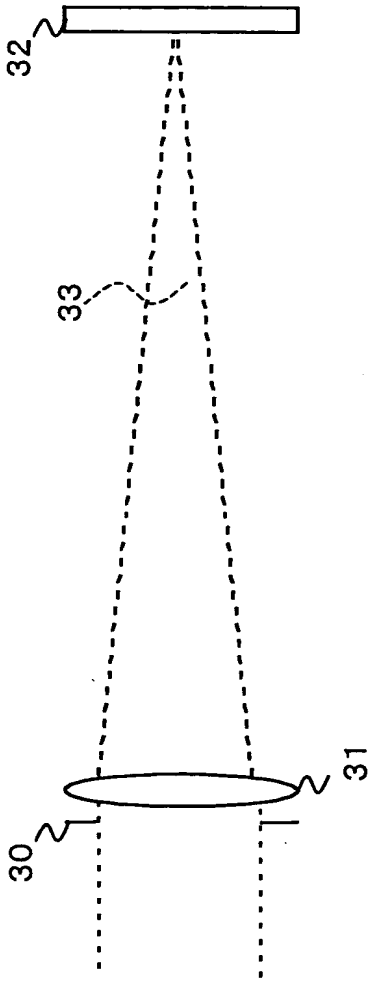


FIG. 10A

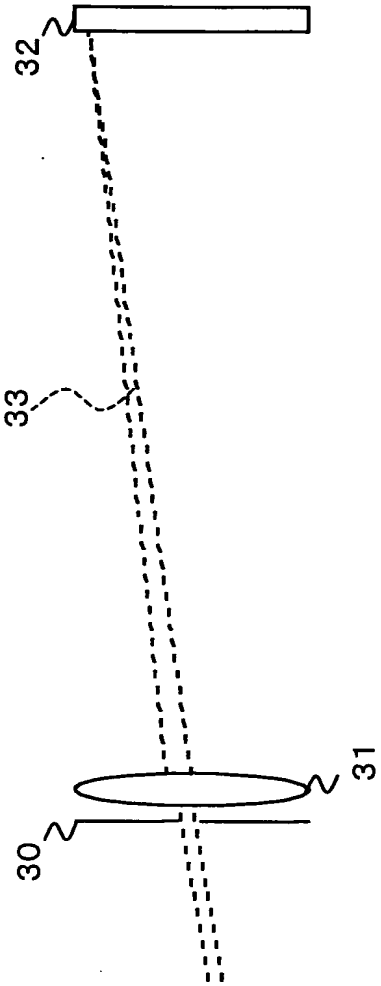


FIG. 10B

FIG. 11

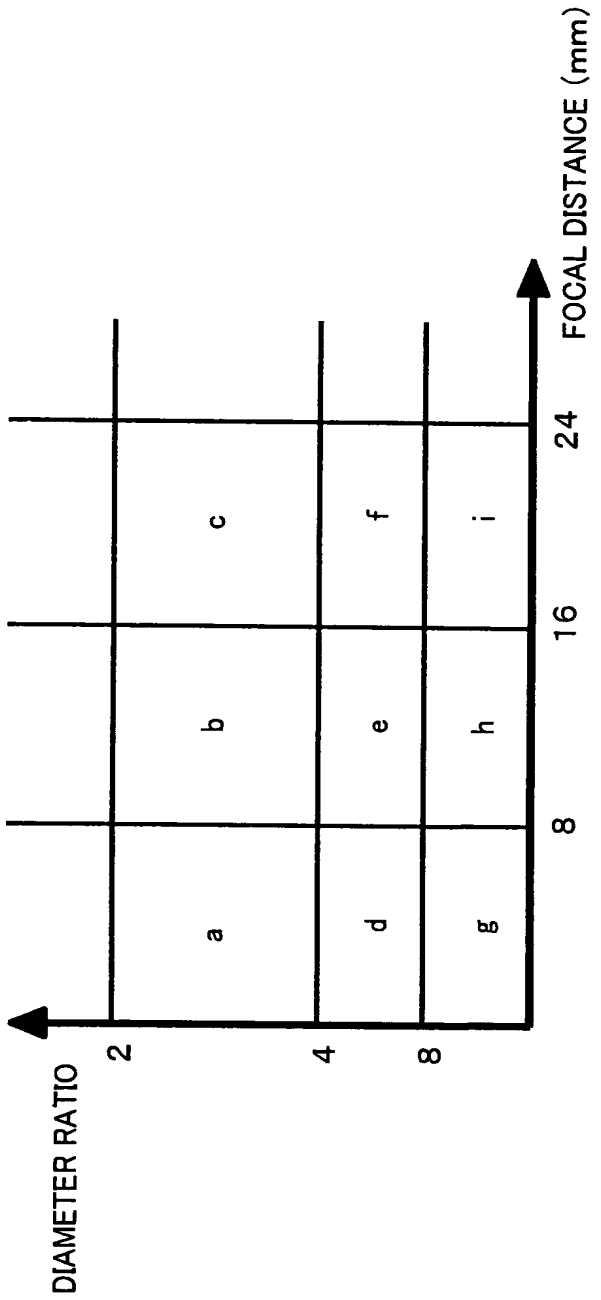


FIG. 12

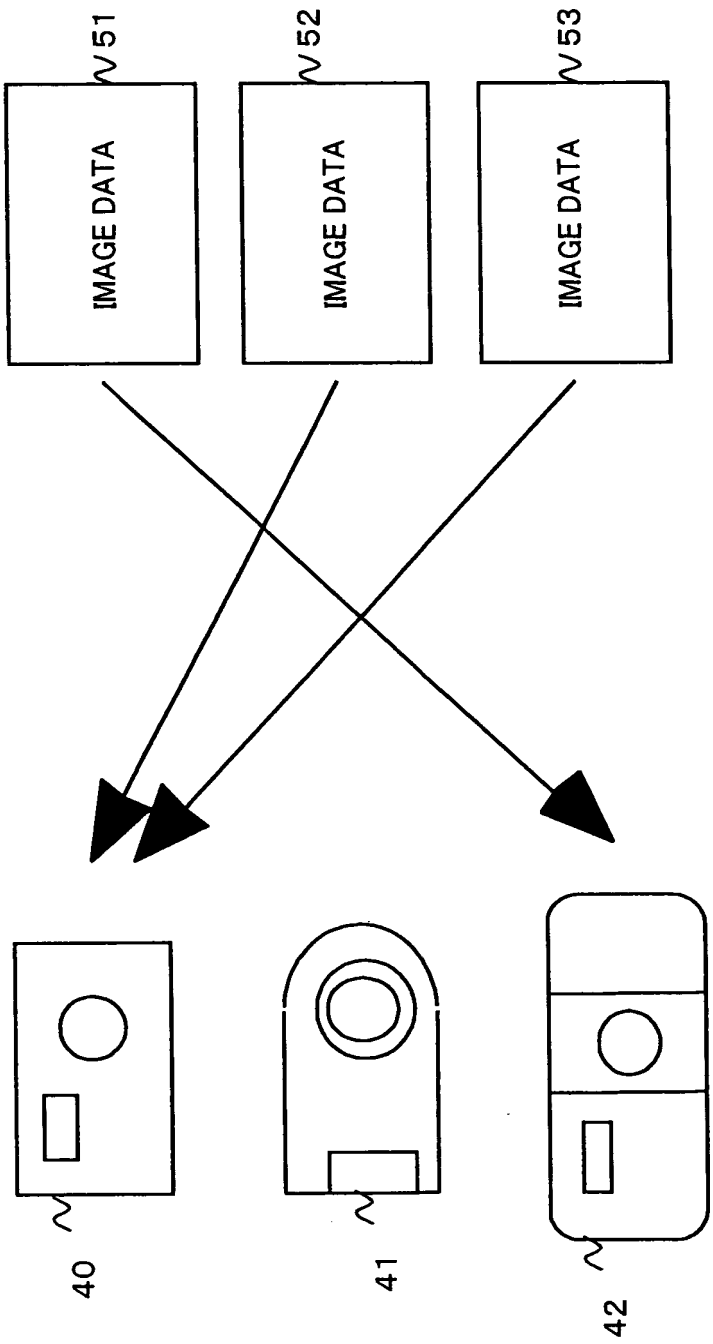


FIG. 13

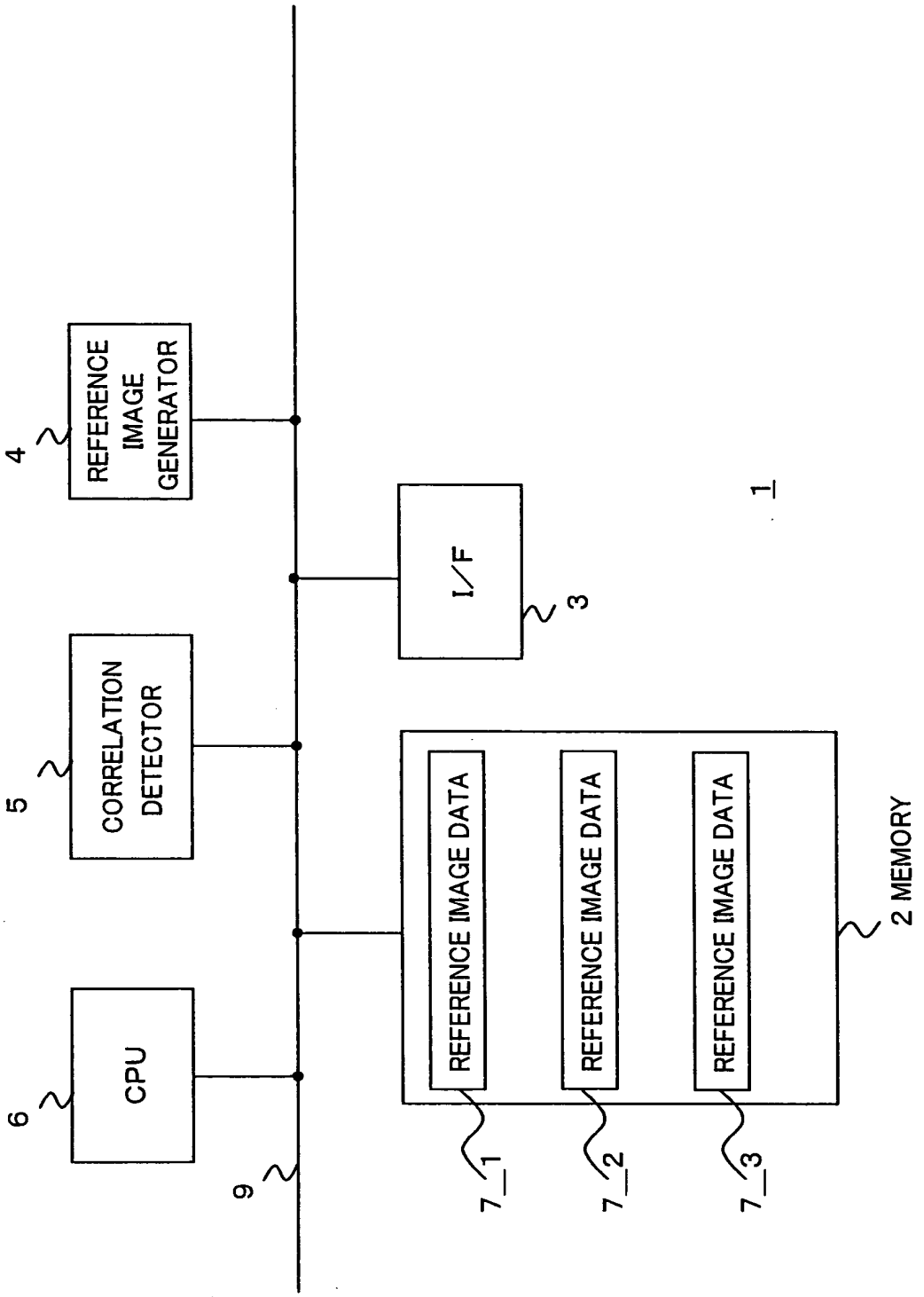
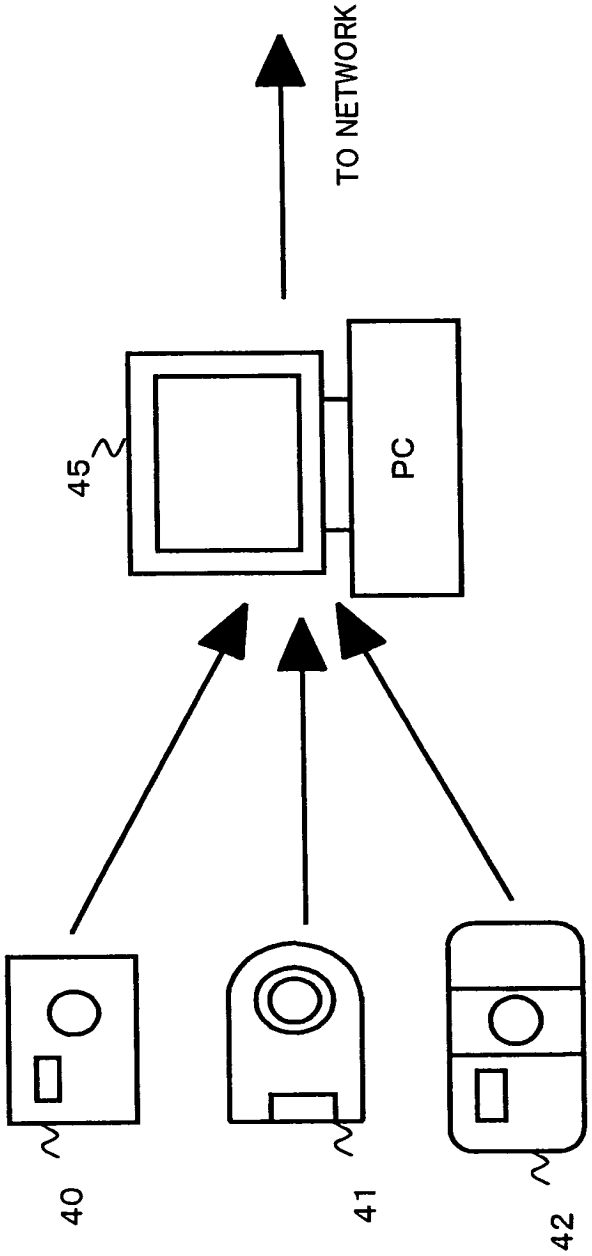

REFERENCE IMAGE GENERATOR
4
CORRELATION DETECTOR
5
CPU
6
9
I/F
3
1
REFERENCE IMAGE DATA
REFERENCE IMAGE DATA
REFERENCE IMAGE DATA
2 MEMORY
7_1
7_2
7_3

FIG. 14



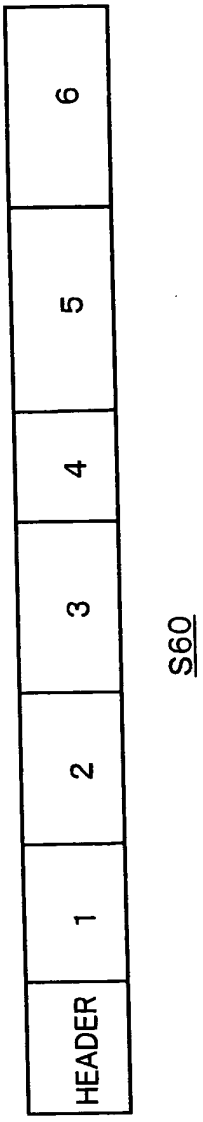


FIG. 15A

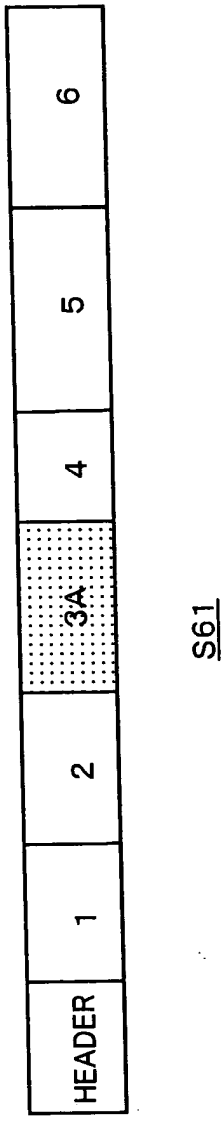
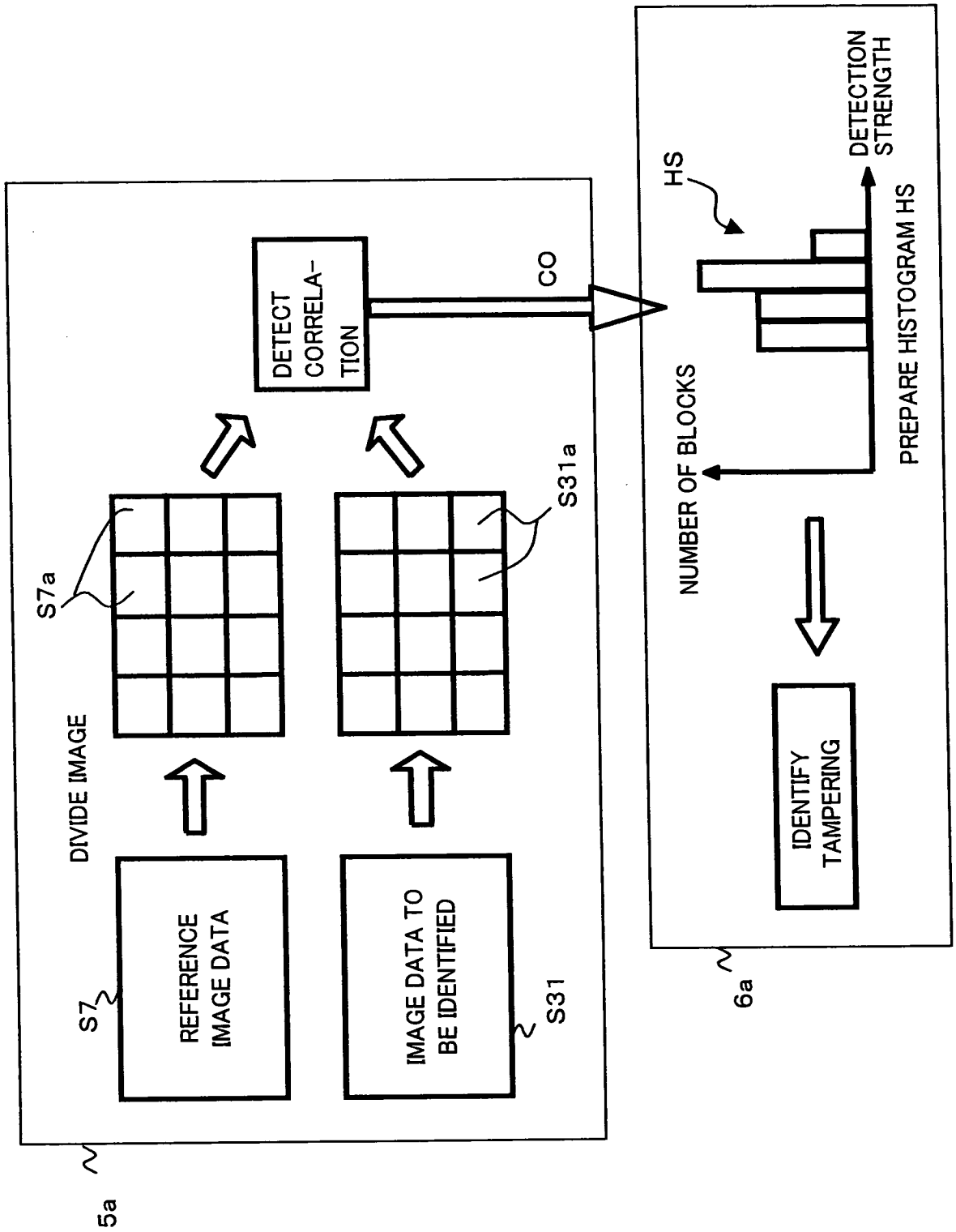


FIG. 15B

FIG. 16


5a
REFERENCE IMAGE DATA
S7
IMAGE DATA TO BE IDENTIFIED
S31
DIVIDE IMAGE
S7a
S31a
DETECT CORRELA-TION
CO
6a
HS
DETECTION STRENGTH
NUMBER OF BLOCKS
PREPARE HISTOGRAM HS
IDENTIFY TAMPERING

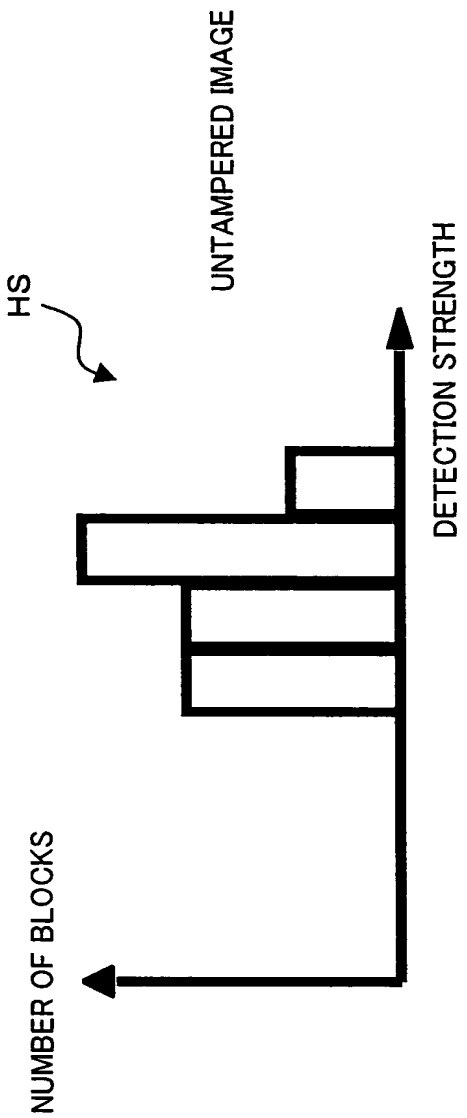


FIG. 17A

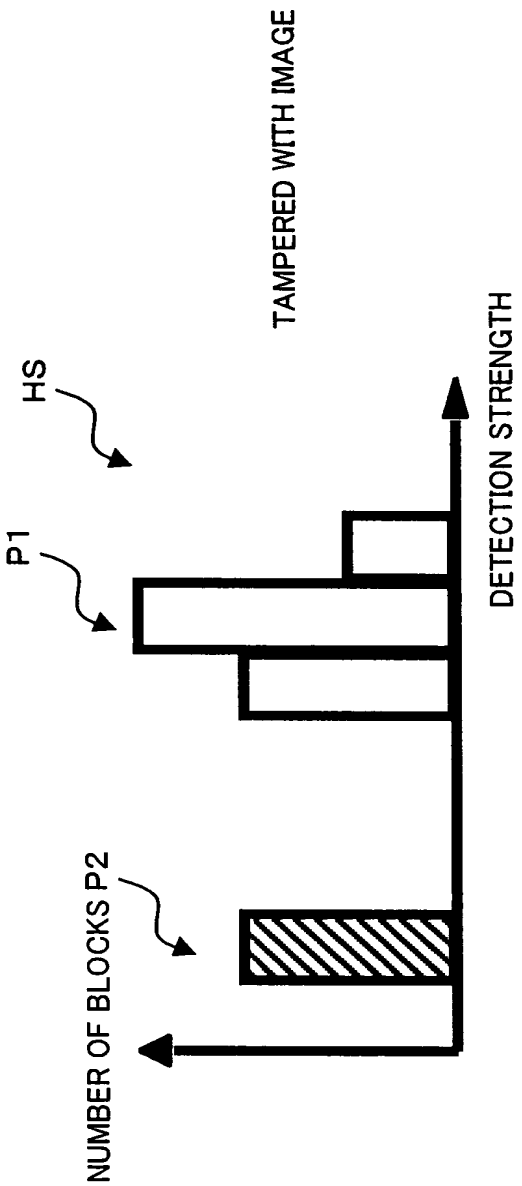


FIG. 17B

FIG. 18

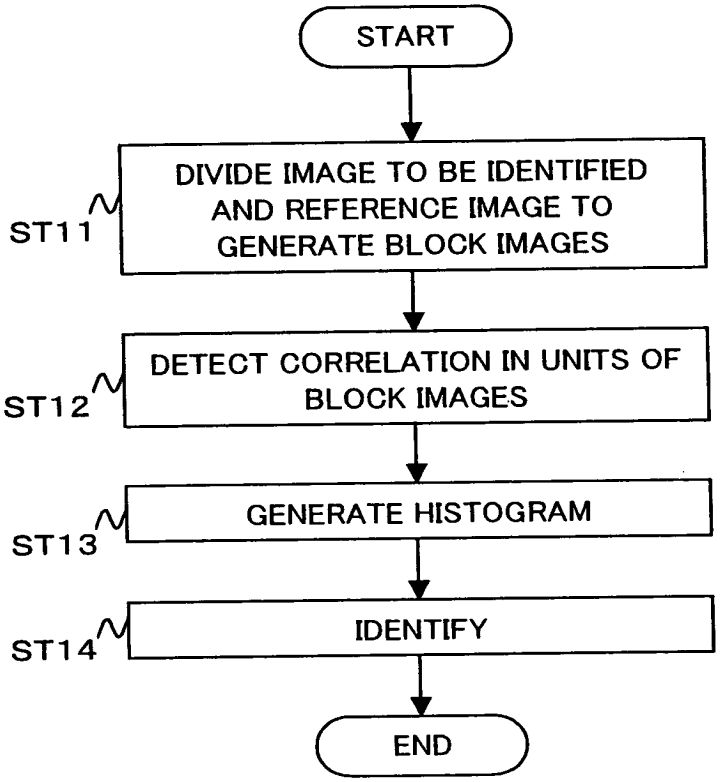

START
DIVIDE IMAGE TO BE IDENTIFIED AND REFERENCE IMAGE TO GENERATE BLOCK IMAGES
ST11
DETECT CORRELATION IN UNITS OF BLOCK IMAGES
ST12
GENERATE HISTOGRAM
ST13
IDENTIFY
ST14
END

FIG. 19

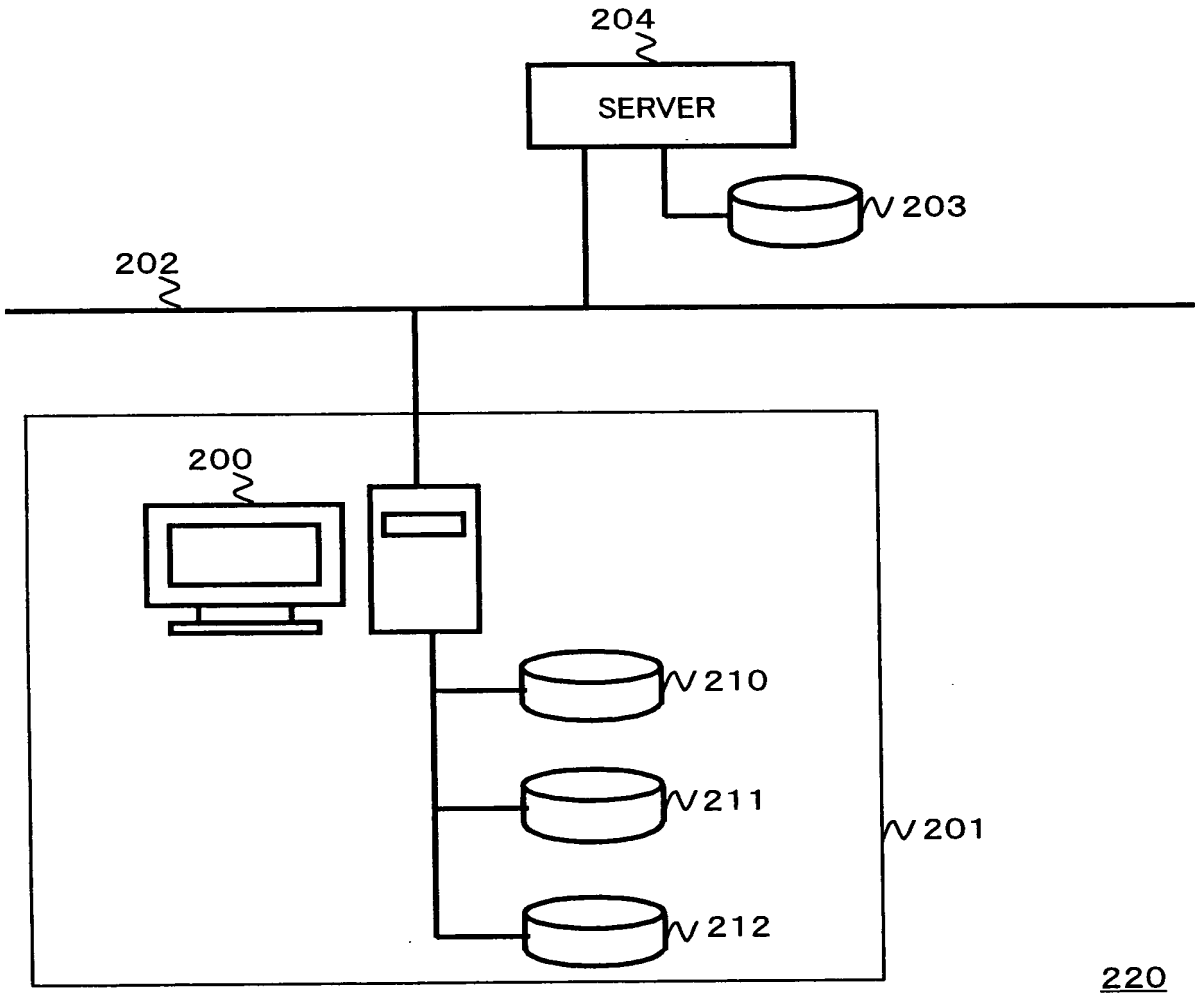


FIG. 20

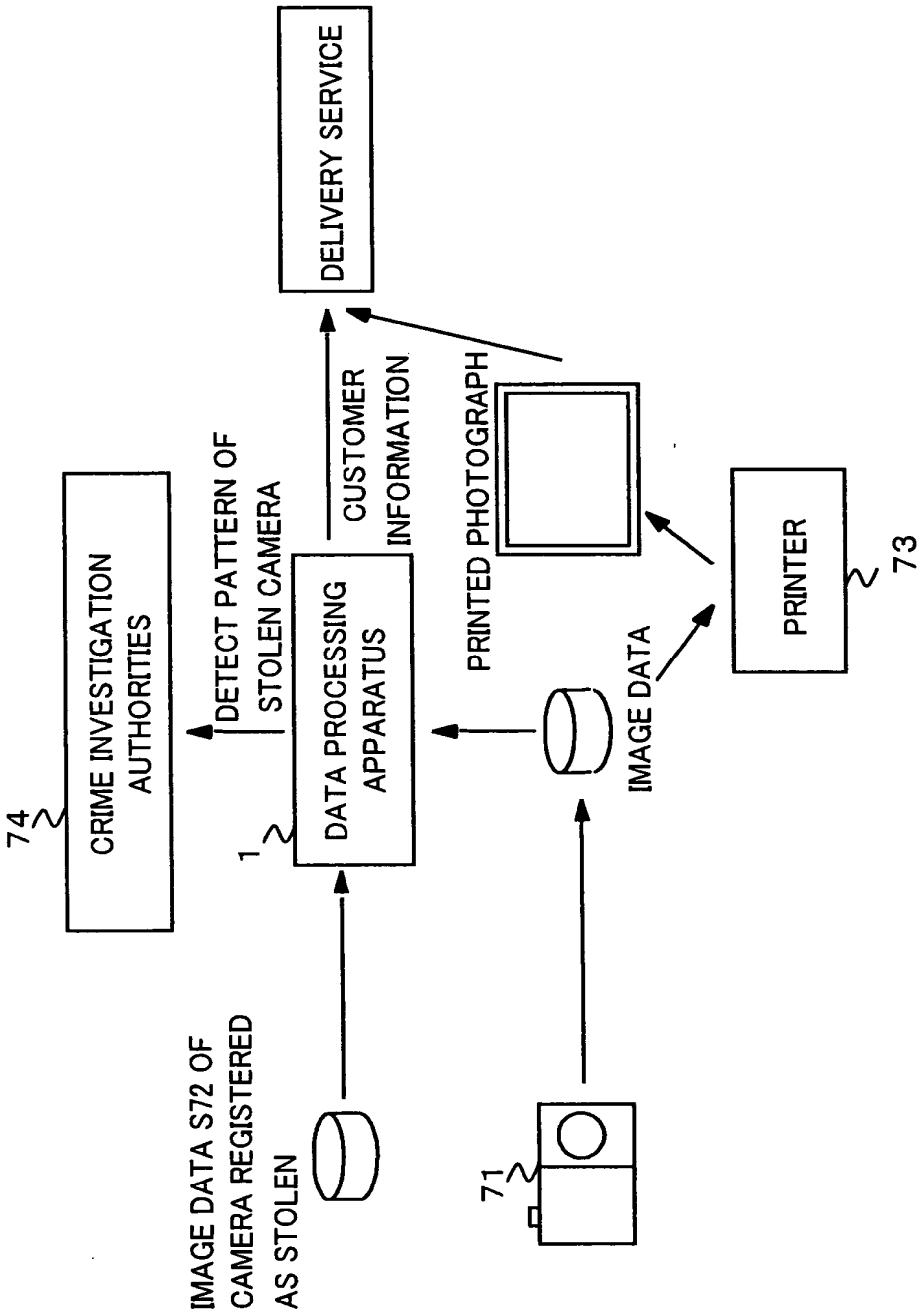

DELIVERY SERVICE
CUSTOMER INFORMATION
PRINTED PHOTOGRAPH
PRINTER
73
IMAGE DATA
DETECT PATTERN OF STOLEN CAMERA
CRIME INVESTIGATION AUTHORITIES
74
DATA PROCESSING APPARATUS
1
IMAGE DATA S72 OF CAMERA REGISTERED AS STOLEN
71

FIG. 21

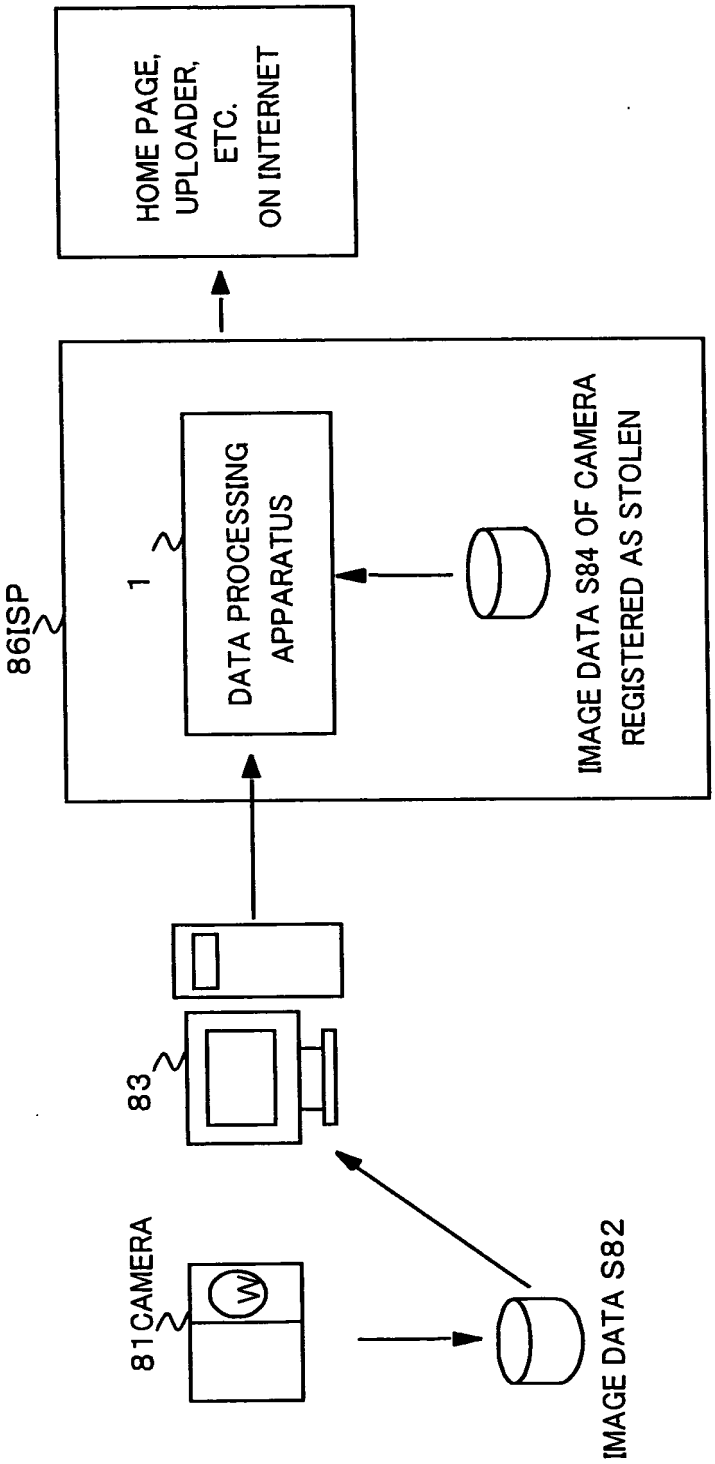

HOME PAGE, UPLOADER, ETC. ON INTERNET
86ISP
1
DATA PROCESSING APPARATUS
IMAGE DATA S84 OF CAMERA REGISTERED AS STOLEN
83
81CAMERA
IMAGE DATA S82

FIG. 22

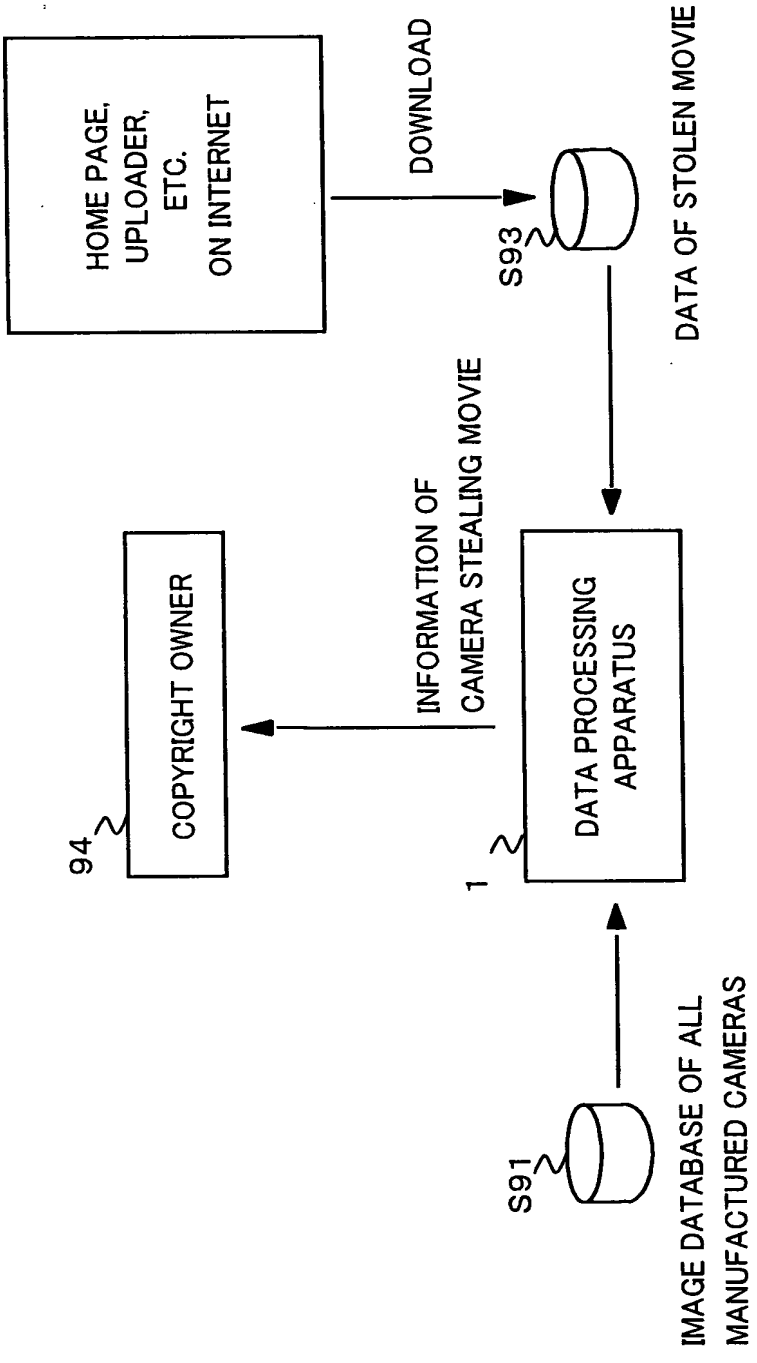

HOME PAGE, UPLOADER, ETC. ON INTERNET
DOWNLOAD
S93
DATA OF STOLEN MOVIE
INFORMATION OF CAMERA STEALING MOVIE
94
COPYRIGHT OWNER
1
DATA PROCESSING APPARATUS
S91
IMAGE DATABASE OF ALL MANUFACTURED CAMERAS

FIG. 23

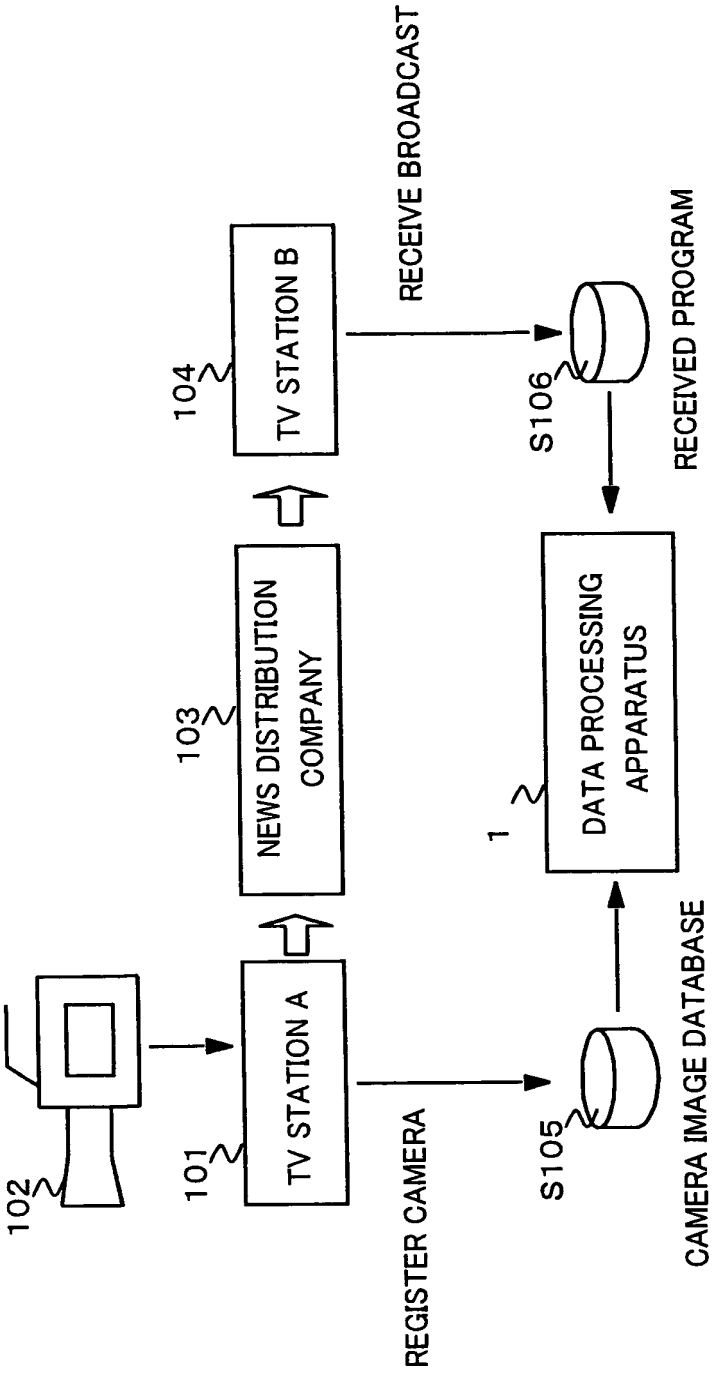

102
101
TV STATION A
103
NEWS DISTRIBUTION COMPANY
104
TV STATION B
REGISTER CAMERA
RECEIVE BROADCAST
S105
S106
1
DATA PROCESSING APPARATUS
CAMERA IMAGE DATABASE
RECEIVED PROGRAM

FIG. 24

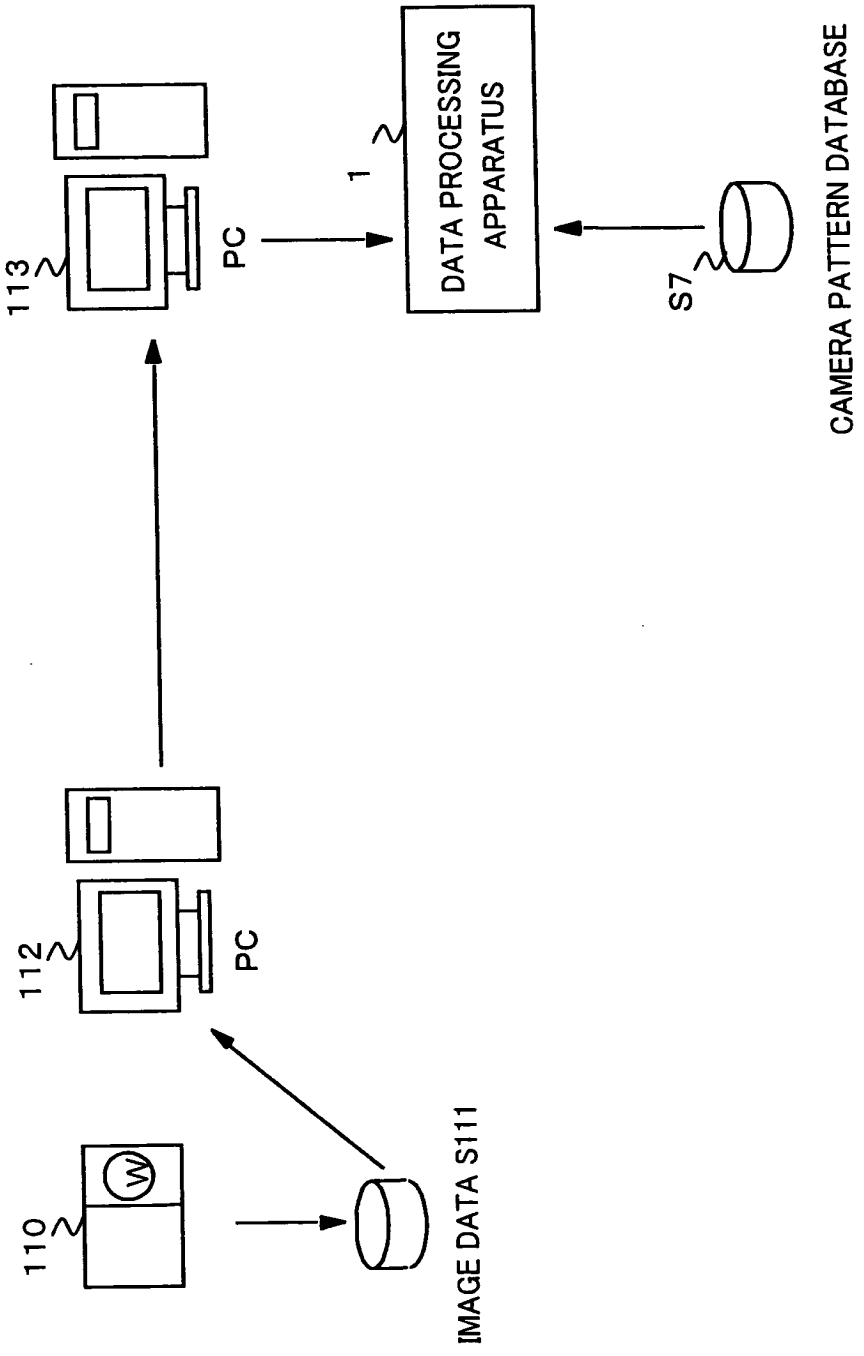

110
IMAGE DATA S111
112
PC
113
PC
1
DATA PROCESSING APPARATUS
S7
CAMERA PATTERN DATABASE

FIG. 25

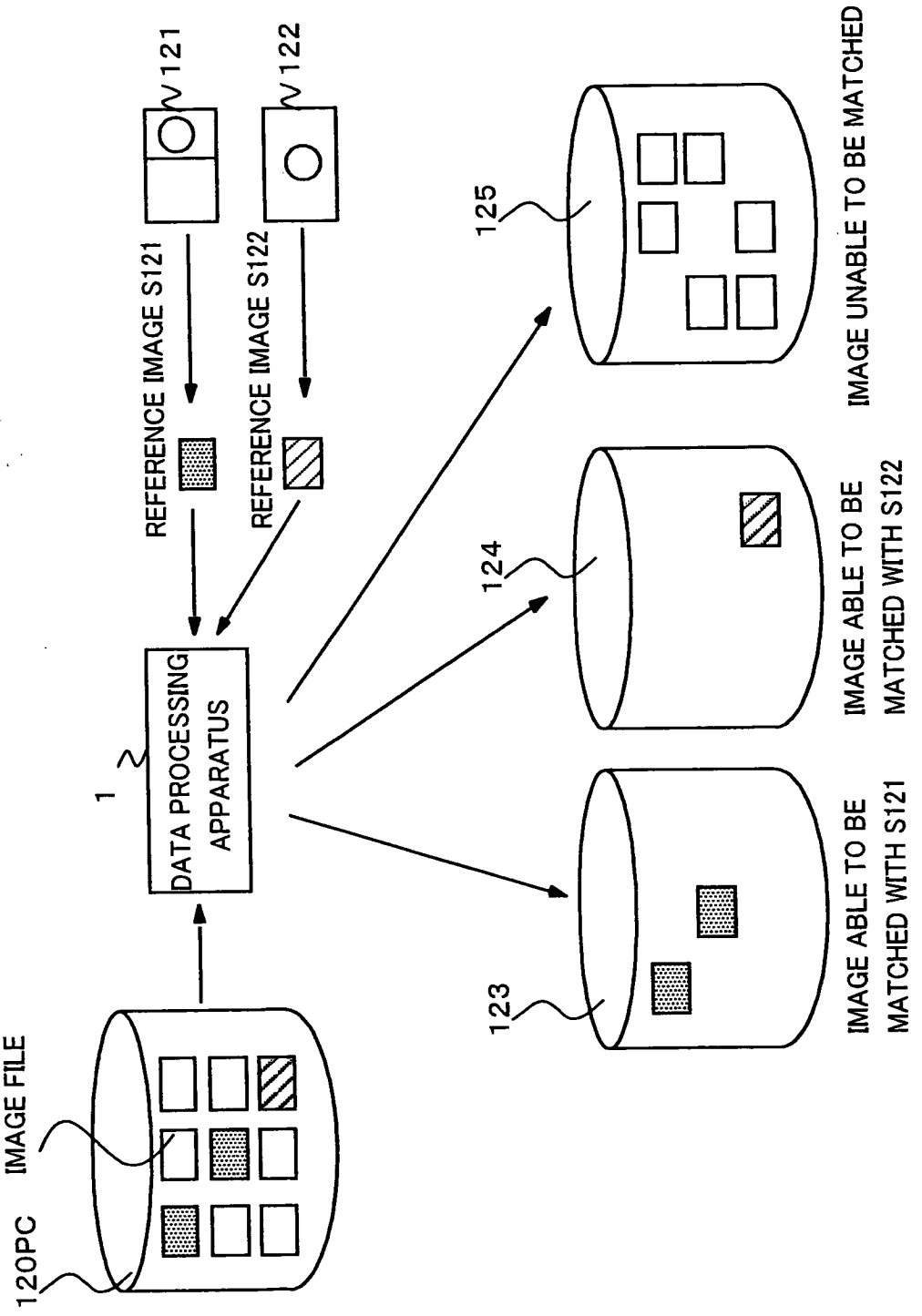

120PC
IMAGE FILE
1
DATA PROCESSING APPARATUS
REFERENCE IMAGE S121
REFERENCE IMAGE S122
121
122
123
124
125
IMAGE ABLE TO BE MATCHED WITH S121
IMAGE ABLE TO BE MATCHED WITH S122
IMAGE UNABLE TO BE MATCHED

FIG. 26

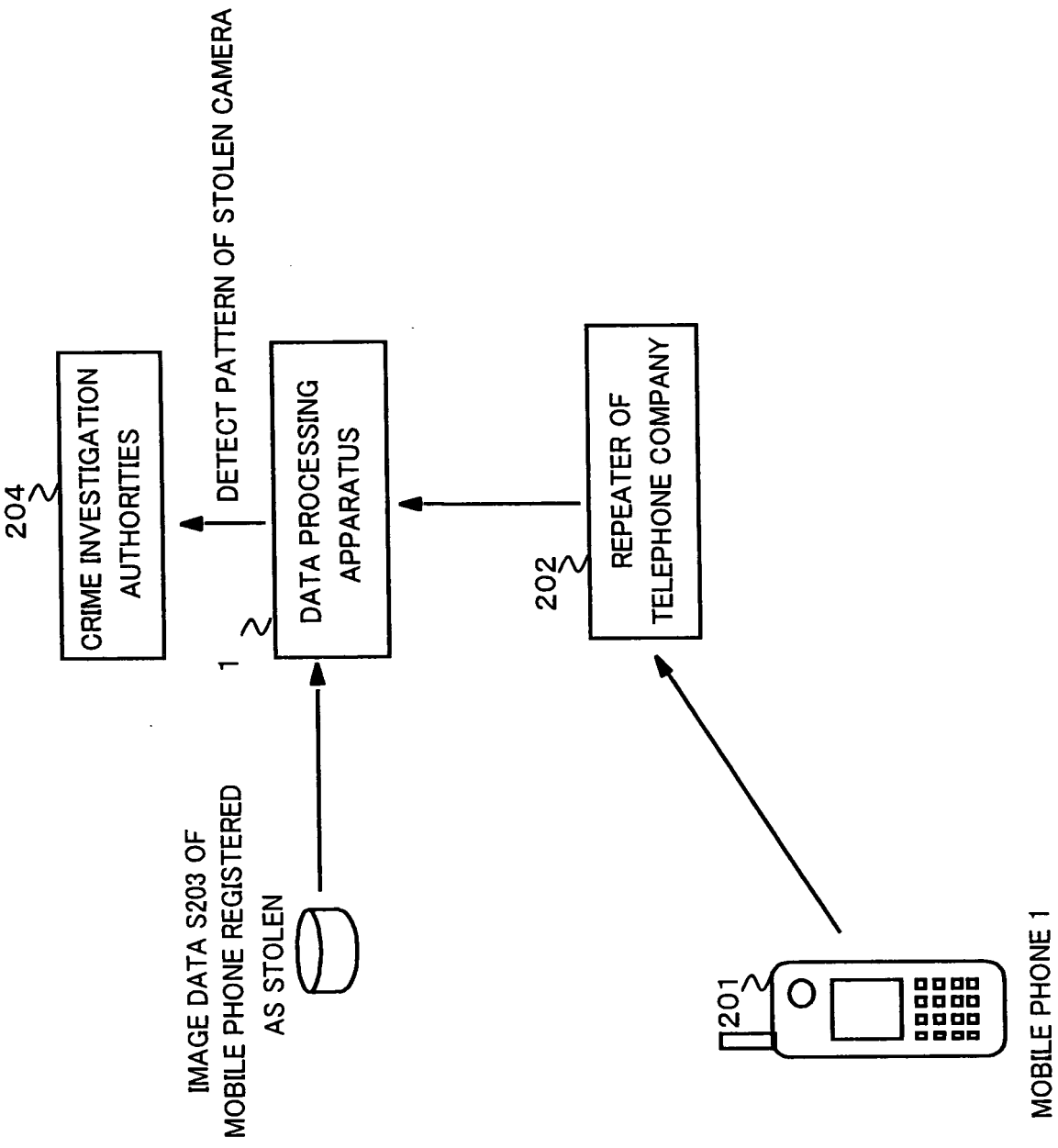

CRIME INVESTIGATION AUTHORITIES
204
DETECT PATTERN OF STOLEN CAMERA
DATA PROCESSING APPARATUS
1
REPEATER OF TELEPHONE COMPANY
202
IMAGE DATA S203 OF MOBILE PHONE REGISTERED AS STOLEN
201
MOBILE PHONE 1

FIG. 27

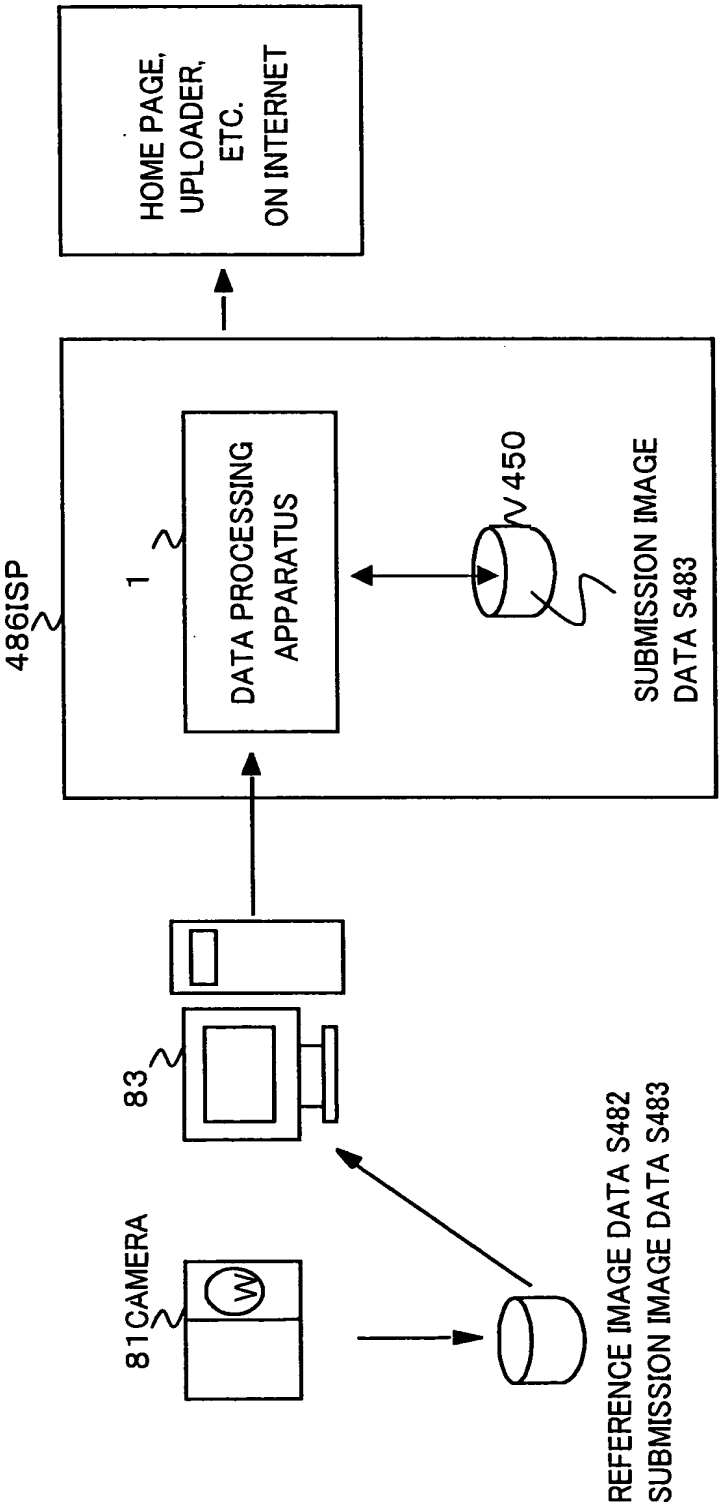

HOME PAGE, UPLOADER, ETC. ON INTERNET
486ISP
1
DATA PROCESSING APPARATUS
450
SUBMISSION IMAGE DATA S483
83
81CAMERA
REFERENCE IMAGE DATA S482
SUBMISSION IMAGE DATA S483

FIG. 28

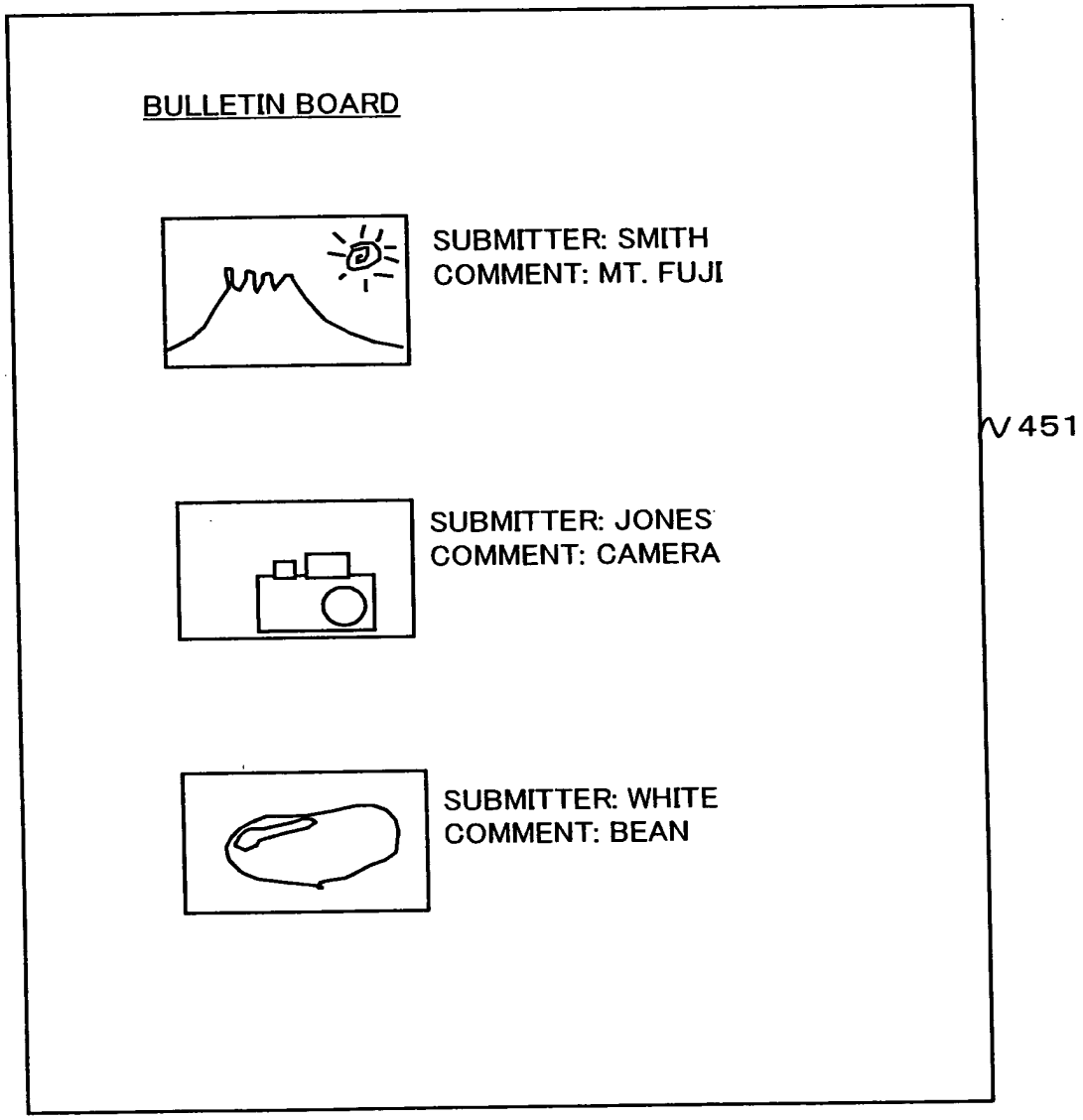

BULLETIN BOARD
SUBMITTER: SMITH
COMMENT: MT. FUJI
SUBMITTER: JONES
COMMENT: CAMERA
SUBMITTER: WHITE
COMMENT: BEAN
451

FIG. 29

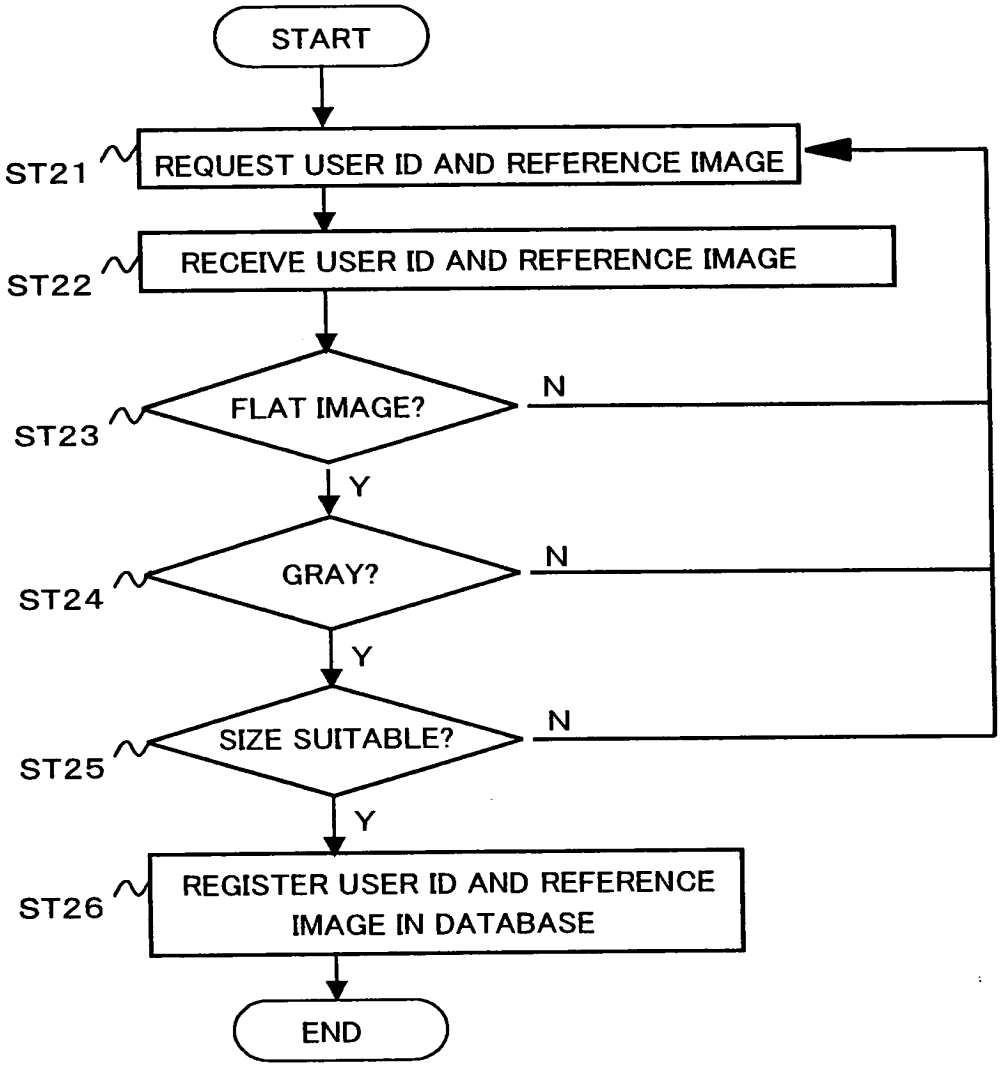

START
ST21
REQUEST USER ID AND REFERENCE IMAGE
ST22
RECEIVE USER ID AND REFERENCE IMAGE
ST23
FLAT IMAGE?
N
Y
ST24
GRAY?
N
Y
ST25
SIZE SUITABLE?
N
Y
ST26
REGISTER USER ID AND REFERENCE IMAGE IN DATABASE
END

FIG. 30

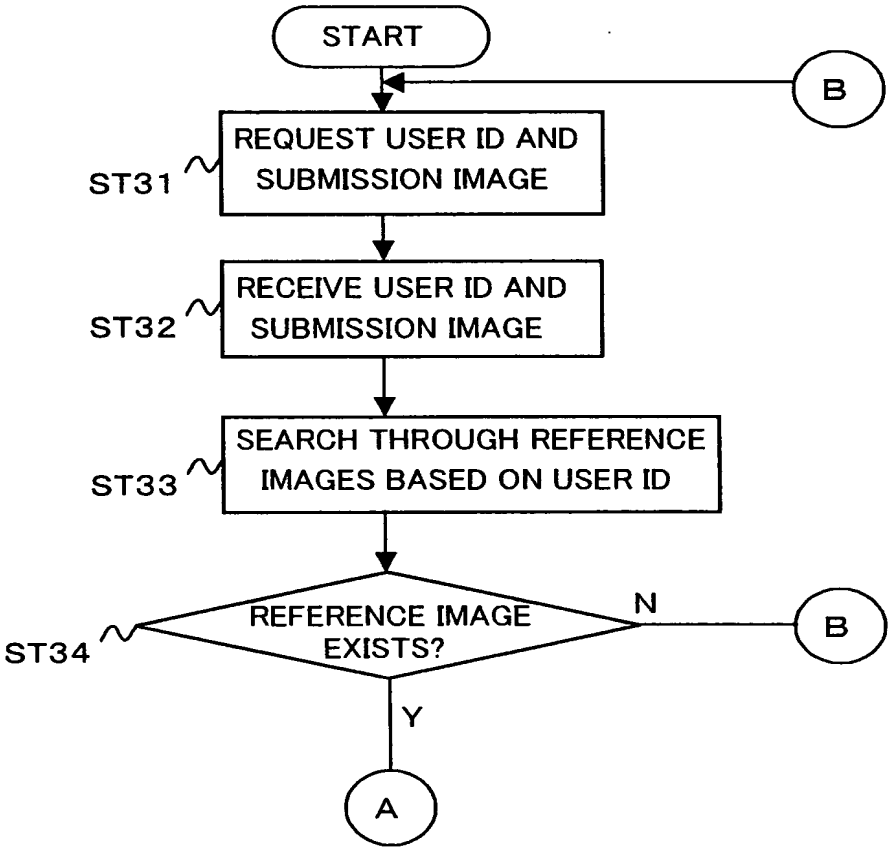

START
B
REQUEST USER ID AND SUBMISSION IMAGE
ST31
RECEIVE USER ID AND SUBMISSION IMAGE
ST32
SEARCH THROUGH REFERENCE IMAGES BASED ON USER ID
ST33
REFERENCE IMAGE EXISTS?
ST34
N
B
Y
A

FIG. 31

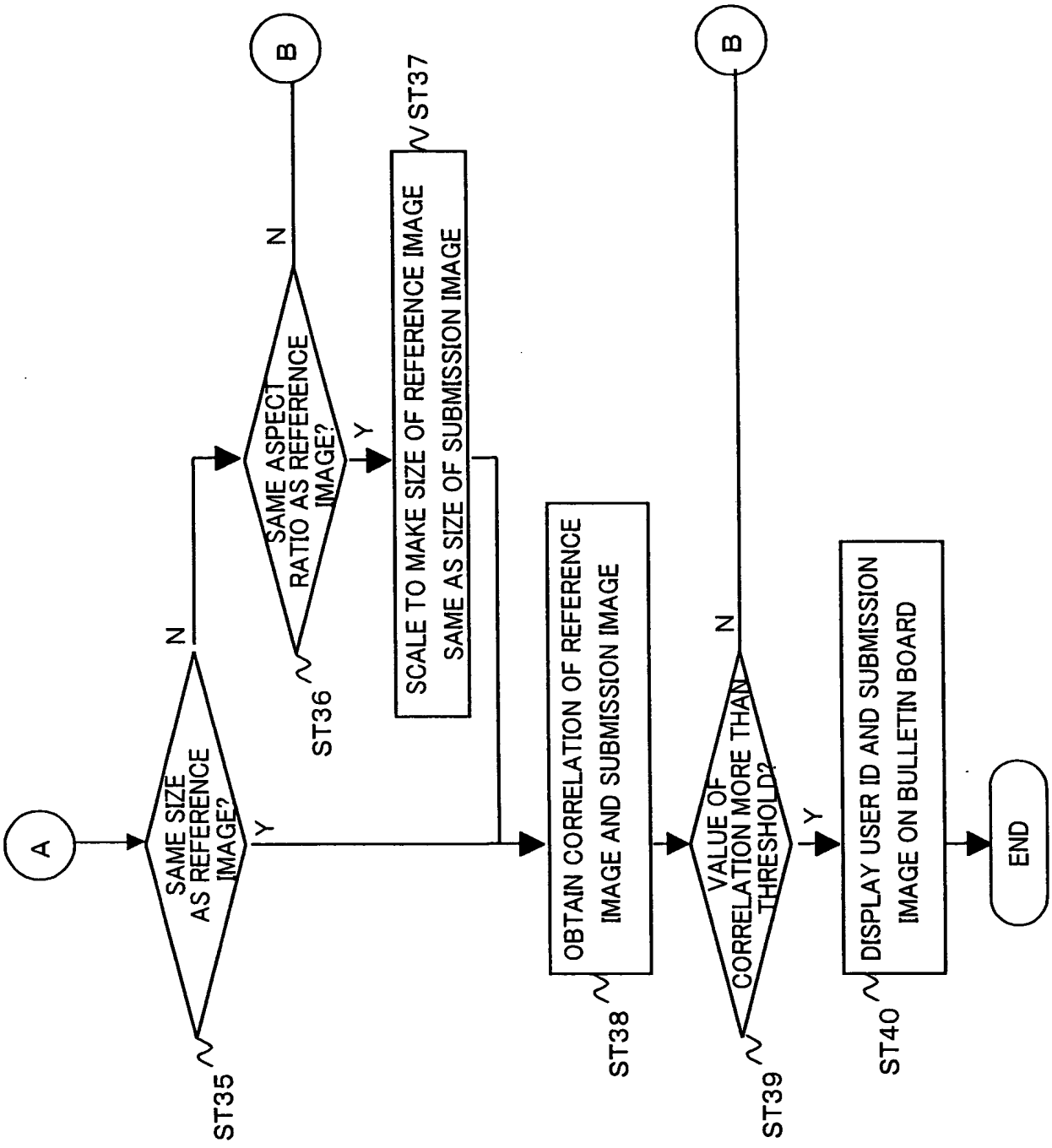

A
SAME SIZE AS REFERENCE IMAGE?
ST35
N
Y
B
SAME ASPECT RATIO AS REFERENCE IMAGE?
ST36
N
Y
SCALE TO MAKE SIZE OF REFERENCE IMAGE SAME AS SIZE OF SUBMISSION IMAGE
ST37
OBTAIN CORRELATION OF REFERENCE IMAGE AND SUBMISSION IMAGE
ST38
B
VALUE OF CORRELATION MORE THAN THRESHOLD?
ST39
N
Y
DISPLAY USER ID AND SUBMISSION IMAGE ON BULLETIN BOARD
ST40
END

FIG. 32

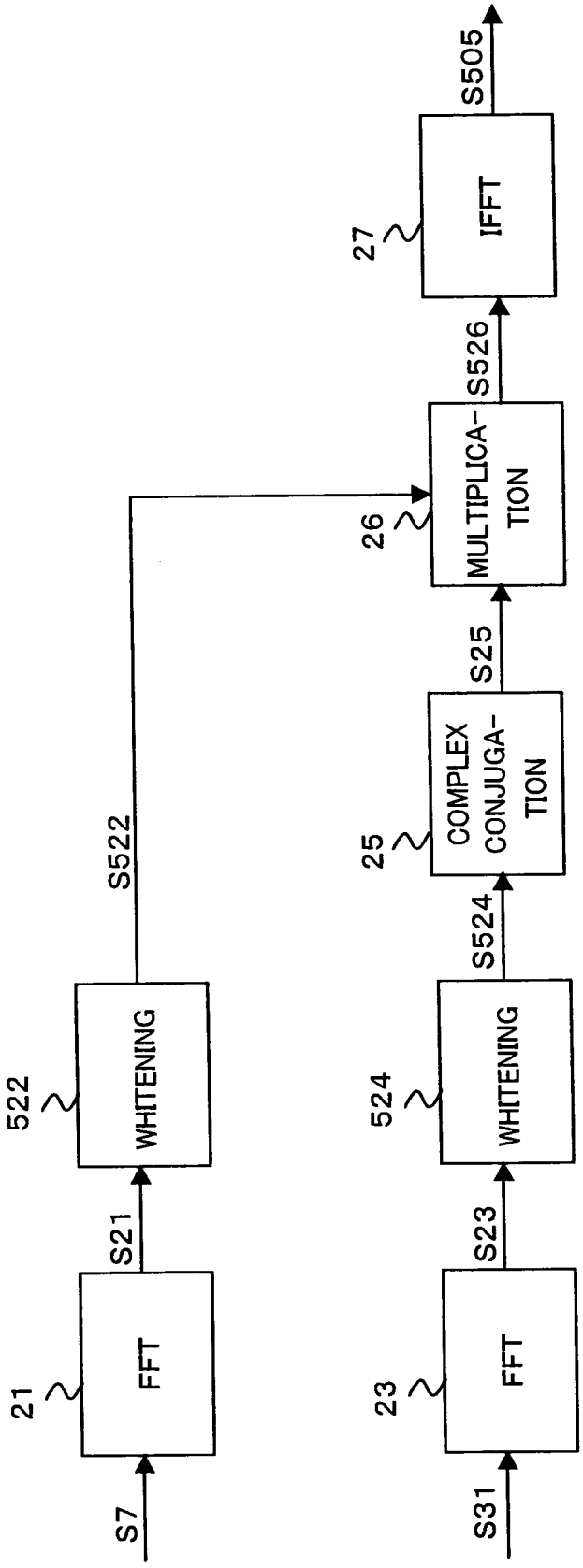

S7
21
FFT
S21
522
WHITENING
S522
S31
23
FFT
S23
524
WHITENING
S524
25
COMPLEX CONJUGA-TION
S25
26
MULTIPLICA-TION
S526
27
IFFT
S505
505

FIG. 33

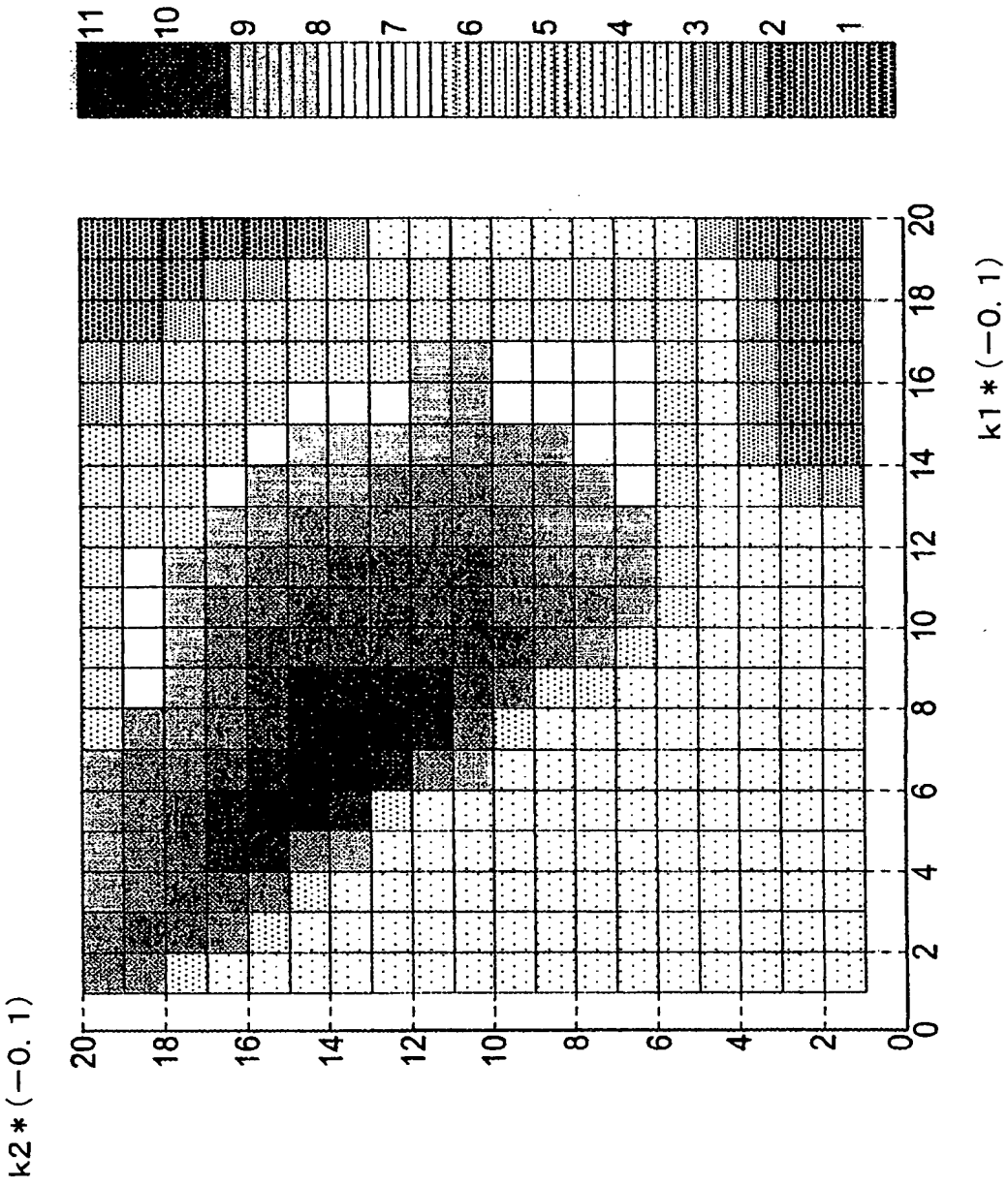


FIG. 34

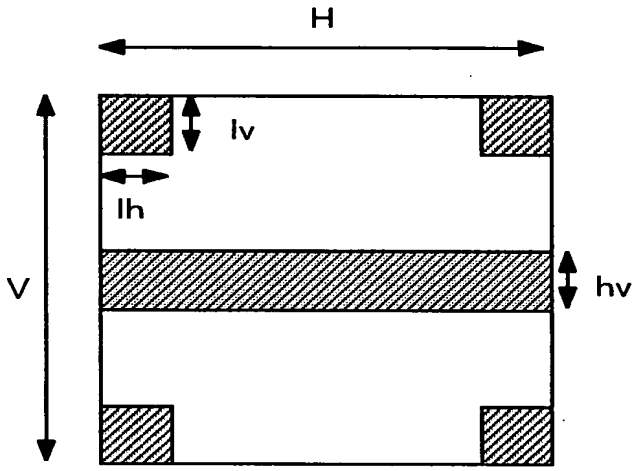


FIG. 35

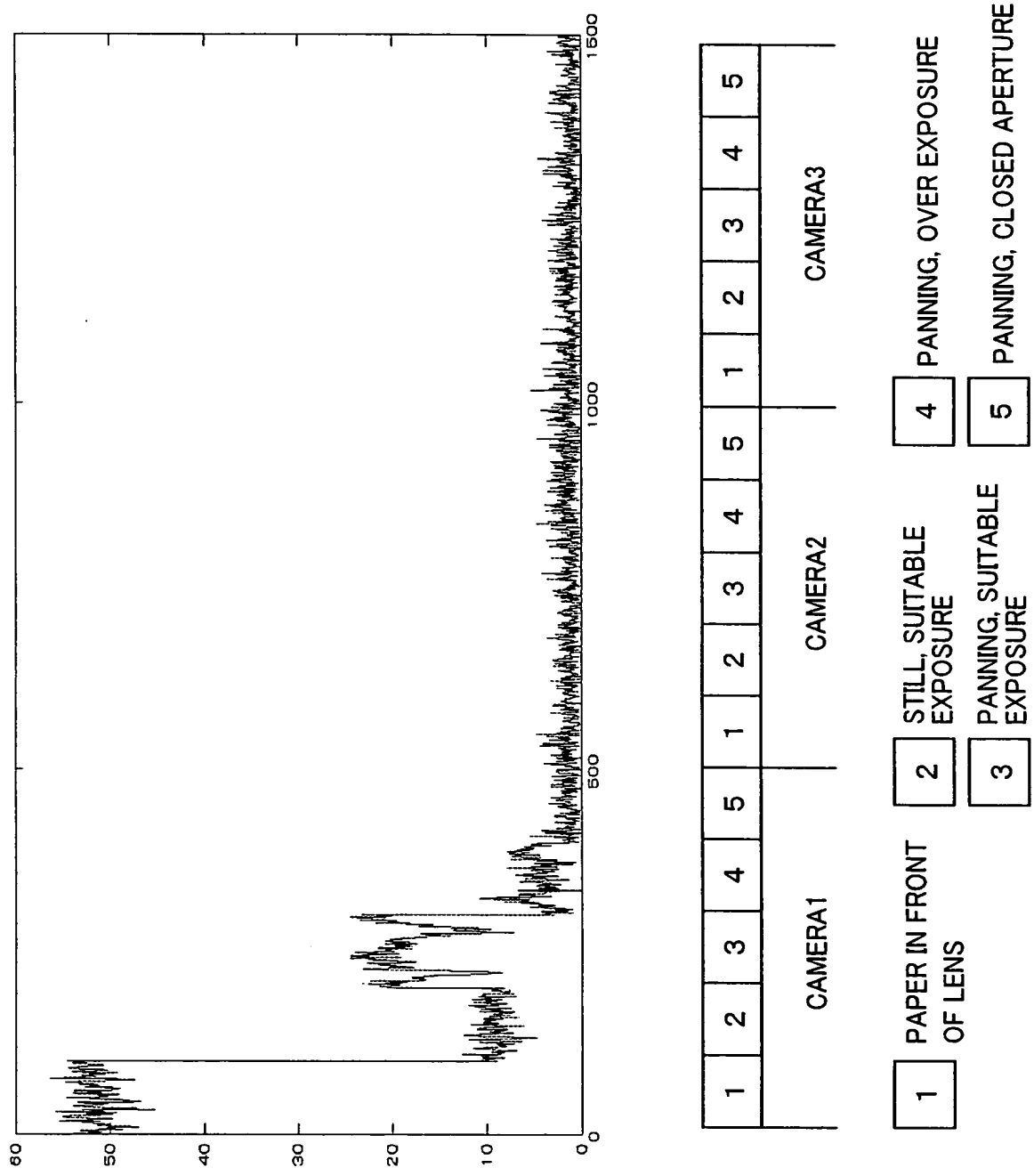
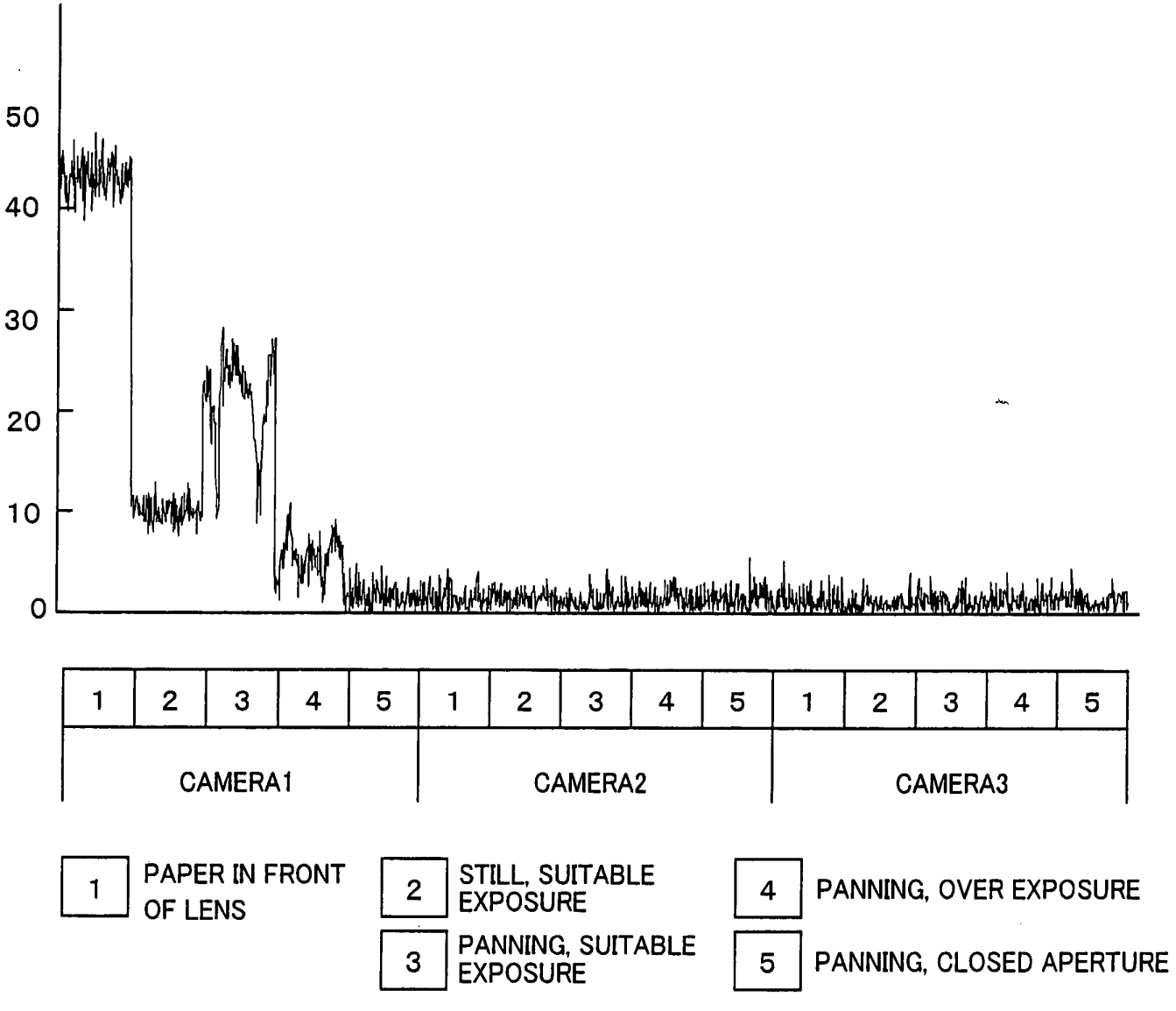

60
50
40
30
20
10
0
0
500
1000
1500
1 2 3 4 5 1 2 3 4 5 1 2 3 4 5
CAMERA1
CAMERA2
CAMERA3
1 PAPER IN FRONT OF LENS
2 STILL, SUITABLE EXPOSURE
3 PANNING, SUITABLE EXPOSURE
4 PANNING, OVER EXPOSURE
5 PANNING, CLOSED APERTURE

FIG. 36



OBLON, SPIVAK, ET AL
DOCKET #: 243627US-6
INV: YOICHI NISHINO
SHEET 36 OF 36